DECEMBER, 1924

Railway Engineering and Maintenance

RAILWAY ENGINEERING AND MAINTENANCE

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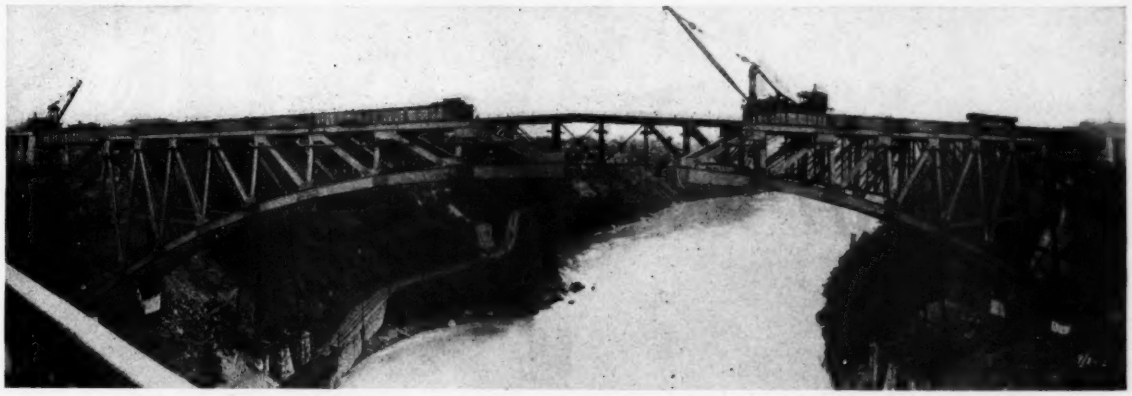

The New Michigan Central Bridge over the Niagara Gorge, span 640 ft.

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 20 **December, 1924** **Number 12**

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WOULD YOU LIKE TO KNOW

How to drain a slipping side hill?
How to simplify building records?
How to organize for snow removal work?
What Winter work has been carried out safely?
How much can be saved by electrical pumps?
Answers to these and other practical questions will be found in this issue.

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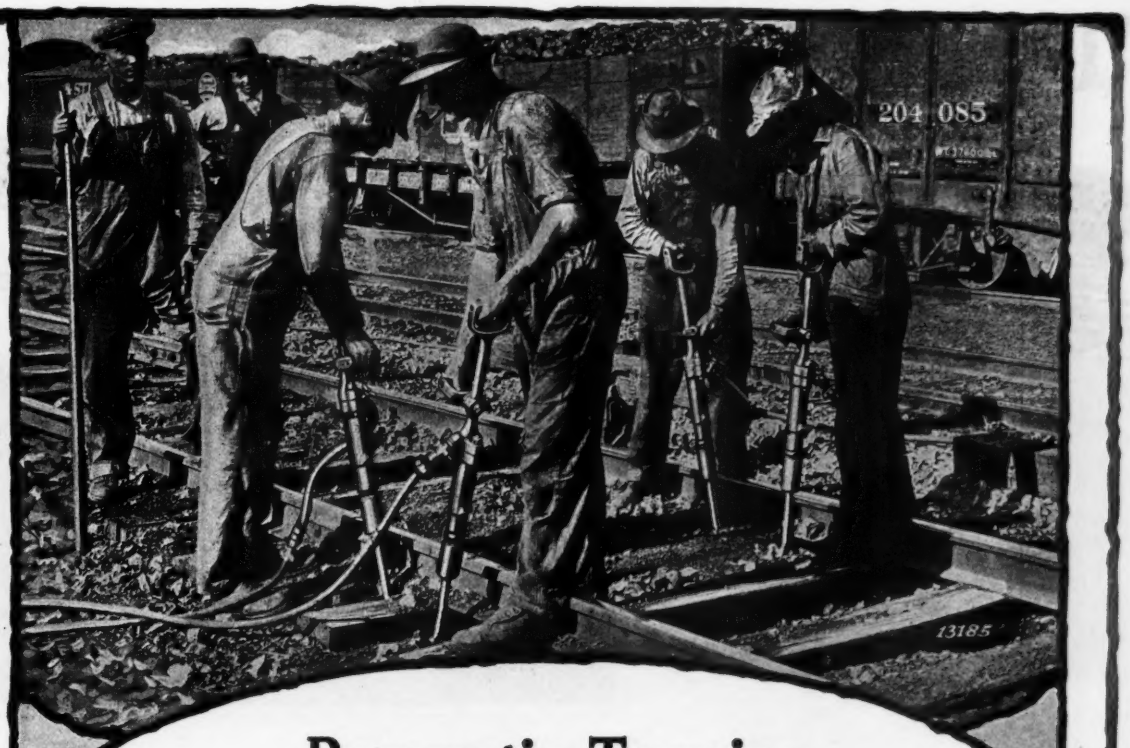

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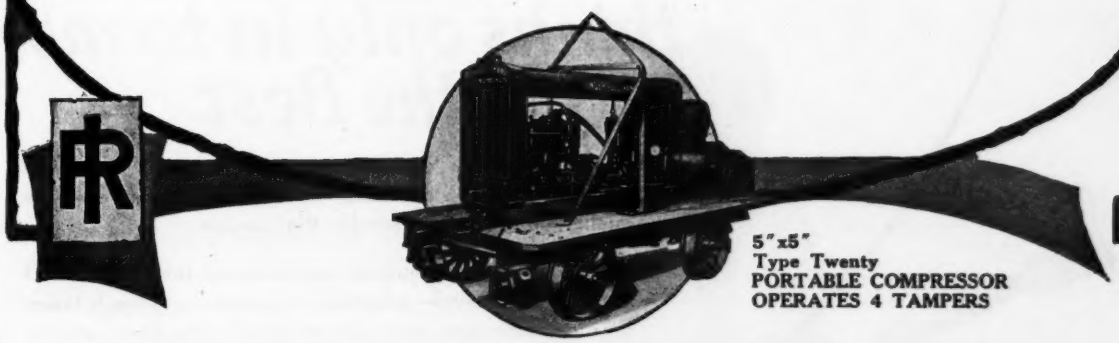

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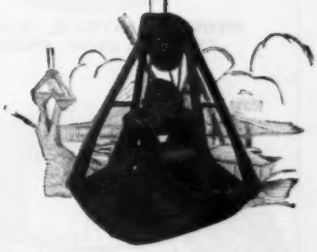

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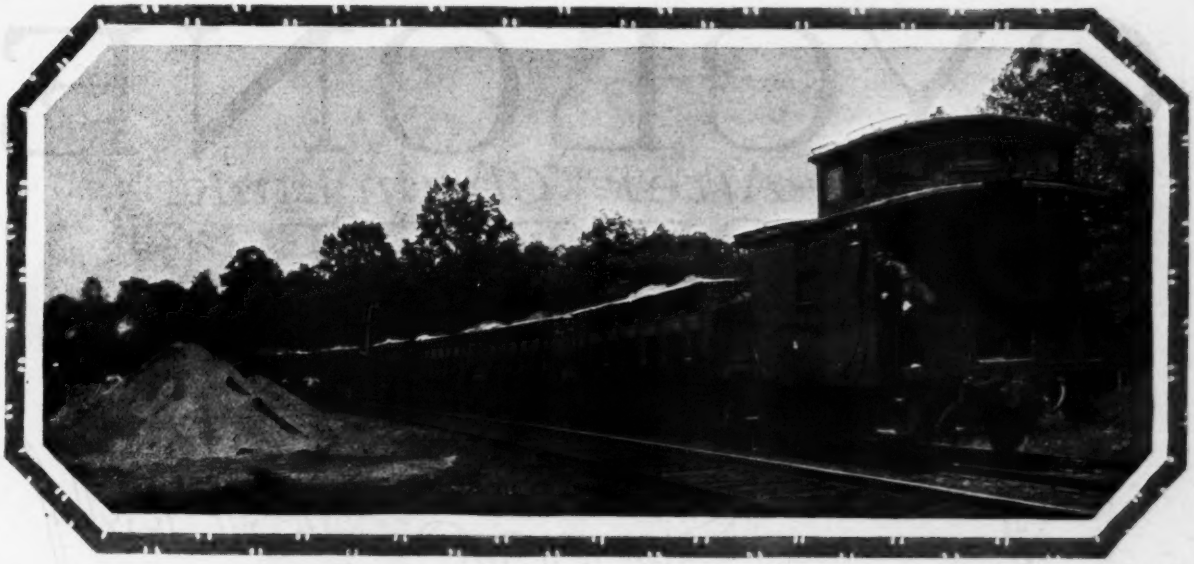

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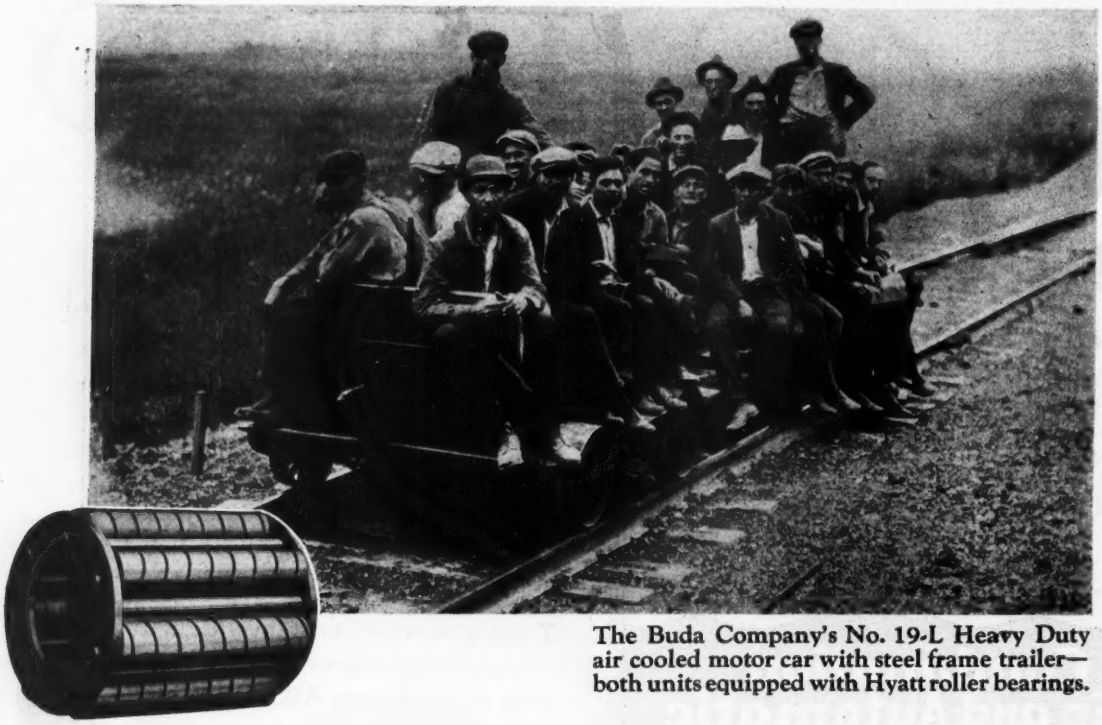

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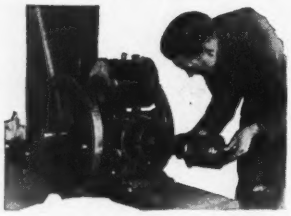

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Railway
Engineering and Maintenance

Volume 20 December, 1924 Number 12

THE HANDICAP OF NEW EQUIPMENT

MUCH stress is placed today and properly so by engineering and maintenance officers on the economy of labor saving equipment. Yet it frequently happens that its adoption is retarded by the attitude of these very officers in opposing the measures which will enable this economy to be effected. It not infrequently happens that the installation of equipment of this character is not followed by any noticeable reduction in the payroll. In other words, after investing in this equipment a sum, large or small, on which it must pay a return, the road is confronted with the same payroll—with the result that the ultimate expenditure is larger rather than smaller. This condition is more responsible than any other single factor for the failure of many executives to approve the recommendations of their maintenance officers for the purchase of labor saving equipment.

But such a condition is one for which they themselves are responsible. If a road is warranted in purchasing labor saving equipment, this equipment must effect an economy sufficient to more than offset the increased charge which it assumes. This return may be in the form of a reduction in force or it may be evidenced in improved maintenance with the same force. If the existing standard of maintenance is all that is justified in the opinion of the management, it is evident that the return must then be secured by a decrease in the number of men employed if the expenditure is to be warranted. The failure to accede to this requirement is not usual, for after once securing the equipment, the maintenance officer frequently proceeds to advance reasons why he cannot afford to reduce his forces. This attitude leaves a management which is responsible for the economical operation of the property no alternative but to refuse to authorize expenditures for such equipment. By forcing their executives to take this stand, maintenance officers are denying themselves the benefit of modern developments and are standing in the way of future improvements.

THE SPIRIT THAT WINS

Railroad life is only paralleled by the romance of the sea. There is no single road to success, but as I study the careers of successful railroad men I believe their success has been due to the ambition to do each job conscientiously and thoroughly. In this way they not only filled such positions well but accumulated capacities for greater responsibilities, for which they were ready when the opportunities came.

The same law governs the development of capabilities as controls physical development. Both require exercise and no one else can supply that exercise for you. Study useful literature. Stretch the mind by tackling difficult matters which require application and concentration to comprehend.

There are hundreds, yes, thousands of officers in railroad service who have risen from the ranks. I doubt if any of them worried very much about promotion. If they worried at all it was about filling the present position. Do not let anyone deceive you with the claim that it is "pull" that counts. There are more "duds" and failures among those with a "pull" than among those who earn what they get through merit. They may succeed temporarily, but like the tree that is planted in sterile soil they soon wither and perish.—*From a talk by J. G. Walber, vice-president, New York Central, before the International Younger Men's conference of the Railroad Y. M. C. A. at Detroit, Mich., on November 17.*

A MORE UNIFORM FORCE IS COMING

AMERICAN industrial methods have been built largely on the constant influx of a large amount of unskilled labor from Europe. As a result of this steady replenishing of the supply there has been an almost continual surplus, of which the characteristic American "hobo" and the "flops" in the larger centers have been evidence. Because of this surplus there has been little incentive for industries to conserve labor and the railways, in common with other employers, have been wasteful in its use.

But this condition is changing. The transition in the character of immigrants has given rise to a change in attitude on the part of the American people which has resulted in a new national policy, limiting the number of aliens who are permitted to enter. The drastic curtailment which is now effective is causing this reservoir of surplus labor to be drained rapidly. The inevitable result will be that those industries which continue to depend on this supply will soon find none available and will be left without assistance by reason of this lack of foresight.

The railways have been among the largest employers of floating labor. They have hired in the spring and discharged in the fall as a matter of habit without thought for the welfare of these men during the winter. In view of the rapidity with which the surplus supply is disappearing it does not require much imagination to see that some spring, perhaps next year, the men laid off the previous fall will not again be available for railway employment for they will have been engaged elsewhere.

An idea of the magnitude of the fluctuation in maintenance of way forces can be gained from the statistics of the Interstate Commerce Commission. These statistics show that while the railways employed 206,477 laborers in section and extra gangs and on work trains in January, 1923, these forces were increased to 327,694 men, or 60 per cent more in August and that they had again been reduced to 210,574 five months later. Considering all forces

in the maintenance of way department, this fluctuation ranged from 322,136 in January, 1923, to 466,349 in August, and then declined to 331,427 in January of this year. In other words, more than 140,000 more men were employed in this one branch of railway service in the summer than in the winter, and were forced to find work elsewhere during the colder months.

The utilization of such a large number of men for only a portion of the year is uneconomical to both employer and employee as is well emphasized in the statement of the Central of Georgia which is quoted on page 490. It is recognized, of course, that much maintenance of way work is of such a character that it cannot be done at any reasonable cost during the winter. It is equally true, however, that the wide fluctuations in the forces during the summer and winter are as much a result of habit as of necessity, and that much work commonly done in the summer can be performed almost, if not fully as economically, in the winter as in the summer, all conditions considered. The articles by G. L. Moore and P. G. Lang, Jr., which appear on pages 491-493, illustrate the character of work which it is possible to complete during the winter and are particularly timely at this season when the roads are now entering the period of cold weather, and when many of them are making further reductions in their forces.

When considering the feasibility of conducting work in the winter one must bear in mind the fact that a certain minimum force must be employed in most branches of maintenance work to cope with the emergencies which arise from time to time. As Mr. Moore points out, it is important that the maximum amount of constructive work be secured from these forces, while as both he and Mr. Lang indicate, it is also possible to complete much work in the winter, which is ordinarily done in the summer and thereby get it out of the way of the summer forces and leave them free to perform that work which can be done only at this season. In comparing the relative costs of work done during the summer with winter operation one should consider all factors, including the increased efficiency of experienced over untrained employees, their greater freedom from accidents, the increased willingness of men to work in the season when work is scarce and the decline in the efficiency of men working in the extreme heat as well as in the cold weather.

Railway officers must also bear in mind the fact that if they are to complete their work in the future they must employ that labor which is available more efficiently than has been done in the past and that this stern necessity will force them to give early consideration to the redistribution of their work throughout the year. In this redistribution the mental attitude with which one approaches it is important. If he believes that the work cannot be done during cold weather the difficulties will probably be insuperable, while if, on the other hand, he is convinced that its performance is possible these difficulties will disappear. That officer will be most consistently successful in the completion of his program who learns to so schedule his work as to prosecute it as uniformly and continually as possible and thereby utilize most efficiently the labor which is available.

MAKING WORK COUNT

IT is an old saying that a stitch in time saves nine. Nowhere does this apply more directly than in the maintenance of railway tracks and structures. They are subjected to the constant wear and tear of traffic as well as the ravages of the weather. Their deterioration is constant and fairly uniform. Their repair must be equally so. If delay and trouble are to be averted one must anticipate failure, although not to the extent of becoming extravagant. That man is most successful who anticipates his points of failure and overcomes them before they develop, becoming by this practice a "maintainer" in the true sense of the word rather than a "trouble shooter." The methods of the man who is constantly confronted with one emergency after another will warrant investigation for it will usually be found that most of these emergencies are not in reality emergencies at all, but merely the result of his failure to anticipate what might normally be expected.

In the maintenance of a property it is not enough, however, merely to repair defects as they arise. One should have as his objective its permanent betterment. That man who constantly repairs a defect when equal attention to the cause of the trouble would eliminate its recurrence saves himself work and effects a permanent improvement by striking at the source of the difficulty. Thus the foreman who shims his track winter after winter to overcome the effects of heaving will do well to consider the installation of drainage at these points next spring to make further shimming unnecessary. If this method is followed step by step in making the various repairs which are demanded it will not be long before the entire section, sub-division, or division will be raised to a higher standard, emergencies eliminated or greatly reduced and the work made more uniform and effective.

CONCRETE AS AN EMERGENCY PROTECTION FOR STEEL WORK

WATER is the enemy of both tracks and structures. While its effect on the track is manifested quickly in poor surface its effect on bridges may be noticable only at the time of inspection and its slow and persistent deterioration may not be realized until serious damage has been done. The only effective means of preserving steel structures lies in spot or complete repainting at sufficiently frequent intervals to keep the metal properly covered. But it happens too frequently that the structure is neglected, so that eventually an inspection discloses so serious a loss of metal that something more than repainting is necessary.

This has led in some cases to encasing the steel in concrete. This may take the form of concrete bases cast around the lower portions of the columns or it may entail a complete covering of the entire structure, applied with the cement gun. Such a sheathing not only affords protection from the elements but in some cases, if properly designed, may be made to serve also as a reinforcement for the structure to compensate for the loss of the steel removed by corrosion.

However, such protective work must be carried out with caution. Not only must pains be taken to insure that all loose rust and scale are removed from the metal before the concrete is applied, but the concrete should be sufficiently dense to be practically impervious to moisture and adequate drainage provided to insure against percolation of water in the encasement. Cases have been observed where failure or inability to carry out this requirement to a sufficient degree of perfection defeated in large measure the purpose for which the work was done, for water was enabled to reach the steel in spite of the protective sheath of concrete and the corrosion continued. This obviously imposes more serious conditions than exist with uncovered steel since the covering serves to conceal the damage until it assumes serious proportions. At first it is to be observed only through the presence of discolored cracks with evidence of seepage, but finally it becomes

manifest by the rupturing of the concrete through the pressure resulting from the expanding effect of the rust formation. The net result is that the expensive protection work proves of practically no value while the deterioration of the structure has proceeded unobserved and has been allowed to progress much further than would have been the case if the metal had been uncovered, so that its true condition could have been observed.

THE BUSINESS TRAINING IS VALUABLE

THAT expenditures for maintenance of way and structures must be under complete control at all times is a requisite of good management that necessitates rigid observance and one in which subordinate maintenance of way officers have been accorded a larger share of responsibility in recent years. There is a tendency in recent years for the managements not only to allot fixed amounts for maintenance of way expenditures to each division but also to subdivide these allotments among the several supervisory officers on the division so that each roadmaster and supervisor of bridges becomes definitely responsible for the expenditures in his department.

This plan does not always meet with a sympathetic response from the subordinate officer. It increases his responsibility and entails rather close calculations on his part in order that he may be enabled to take full advantage of his allotment without exceeding it and he is inclined to feel that he will be unjustly criticised if he fails to "live within his income." In some cases this attitude may have considerable justification due to the failure of the management to take the division forces into its confidence and explain the basis of the allotment, a condition which has been overcome on some roads by the holding of monthly meetings of maintenance officers for the purpose of discussing the distribution of expenditures for the subsequent period. But the subordinate officer should bear in mind that the responsibility placed on him by the specific allotments affords the best form of business training, for it makes him more nearly the general manager of his own subdivision.

Letters to the Editor

CROWNING CONCRETE ROADWAYS

Chicago.

To THE EDITOR:

The "What's the Answer" department of *Railway Engineering and Maintenance* for September presented the problem of crowning concrete roadways in an able manner. There is some question, however, whether a slope of ¼ in. to the foot is necessary for team track driveways. It appears that the amount of slope as well as its direction depends, to a large extent, on the conditions of use of the driveway. The question whether the roadway should be crowned or whether it should be dished also depends upon whether the drainage can be best taken care of at the center of the driveway or at the side of the driveway.

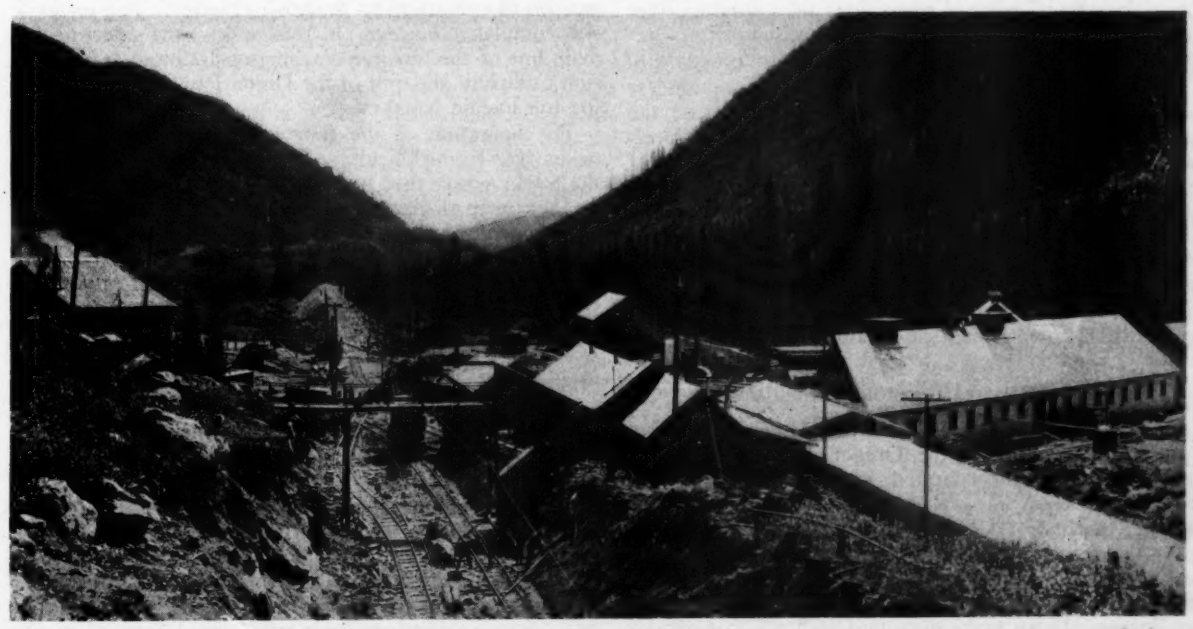
In the case of a driveway constructed along a warehouse the slope should be well in one direction, viz., away from the warehouse. While if the driveway has a natural longitudinal slope, practically no cross slope is necessary. A good rule for fixing the slope for drainage is that the difference in elevation shall be not less than 1/100 nor more than 1/50 of the width.

Where team tracks are constructed inside of a building and where it is desired to keep these tracks in a clean and sanitary condition, an increase in the slope is often advisable in order to facilitate the processes of cleaning, especially where this is to be done by the use of a stream of water from a hose.

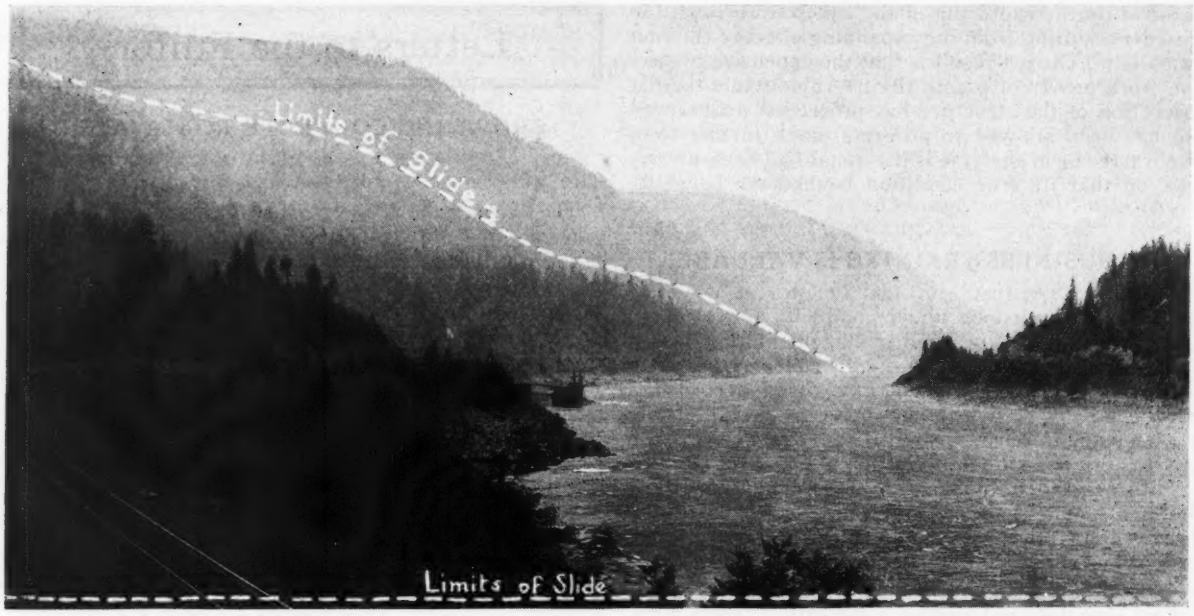
Obviously in climates where no freezing occurs the question of slope for drainage may be neglected, with no more serious results than a little water in the inequalities produced by imperfect finishing. It is a simple matter to eliminate these inequalities in finishing by the use of a strikeboard and making sure that a roll of concrete precedes the forward progress of the strikeboard throughout the entire length of its edge across the pavement.

A. C. IRWIN.

Manager, Railways Bureau, Portland Cement Association.



Looking over the Approach to the East End of the Moffat Tunnel



General View of the Slide From a Point Near Tunnel Five

How the O.-W. R. & N. Overcame a Landslide by Drainage

Tunnels Built Far Into Bank Provided Outlet for Water and Arrested Movement

THE Cascade Locks landslide—the "Sliding Mountain" of the early railroaders in the Northwest, has yielded to engineering analysis, and to a course of treatment, extending over a period of about six years. The results justify the belief that the work has been effective.

This landslide is located about 42 miles east of Portland, Oregon, near the town of Cascade Locks. It lies across the natural railroad route along the Columbia river and at the very beginning of railroad development in Oregon it presented itself as a problem to be reckoned with.

In 1873 the Oregon Steam Navigation Company undertook the construction of a portage railway around the Cascades of the Columbia and carried on the work intermittently through four lean years following the panic of 1873. In 1877 the president of the company was directed by the board of directors to suspend construction, because "the disturbed condition of the ground for two miles or more over which said road must be built caused by unusual slides from the mountains is of so serious a character as to create doubts as to the propriety of grading until the ground shall show evidence of being undisturbed."

Early Reports Foretold Difficulties

In the following year the uncompleted line passed from the ownership of the Oregon Steam Navigation Company to be incorporated into a transcontinental project. When work was resumed H. M. McCartney, engineer in charge of construction, reported: "For two miles along the side hill the whole country seems to be moving steadily toward the river like a glacier. It is all broken and full of fissures and unstable looking to the last degree. If we make deep thoroughcuts transversely through it the effect will be to make the loose ground work from both sides back into the cut and all slides and lifts of the bottom will have to be dug out and loaded on cars to be removed. If we make a side cut there will be only one slope to look after and all material which comes in can simply be shoveled over the open side of the cut." The experience of the succeeding 40 years fully justified Mr. McCartney's forecast of maintenance and his comparison of conditions to those of a glacier. The roadbed was completed, however, in 1882 and is now a part of the main line of the Oregon-Washington Railroad & Navigation Company, the unit of the Union Pacific System serving the Pacific Northwest.

The operation of the railroad over this stretch was never free from difficulty. The expenditures for raising the tracks where they had subsided and for relining them as they were displaced laterally, were very heavy from year to year. In 1894 the summer flood of the Columbia reached a stage higher than any other which has been recorded and (if dependence may be placed on indications more or less reliable), probably higher than any which had occurred in centuries previous. Along the slide where the river's channel is restricted and its current rapid, the railroad was destroyed.

Immediately after the flood the line was reconstructed but at a higher elevation, resulting in increasing the gradient from 0.5 to 1 per cent. While the steeper gradient controlled tonnage in an engine district of 84 miles, it was nevertheless demanded by physical conditions and was not discordant with the then existing or anticipated volume of traffic.

Projects looking toward the reduction of this grade were suggested later, from time to time. These would have been justified under normal conditions of main-

tenance, but did not meet the approval of sound judgment, which preferred a section of road that could be operated with extreme care although at rather heavy expense, to the hazard of having none at all as the probable result of changing the contour and affecting the equilibrium of the ground. Moreover, the movement had persisted through more than a generation, and seemed more easily to be endured than corrected.

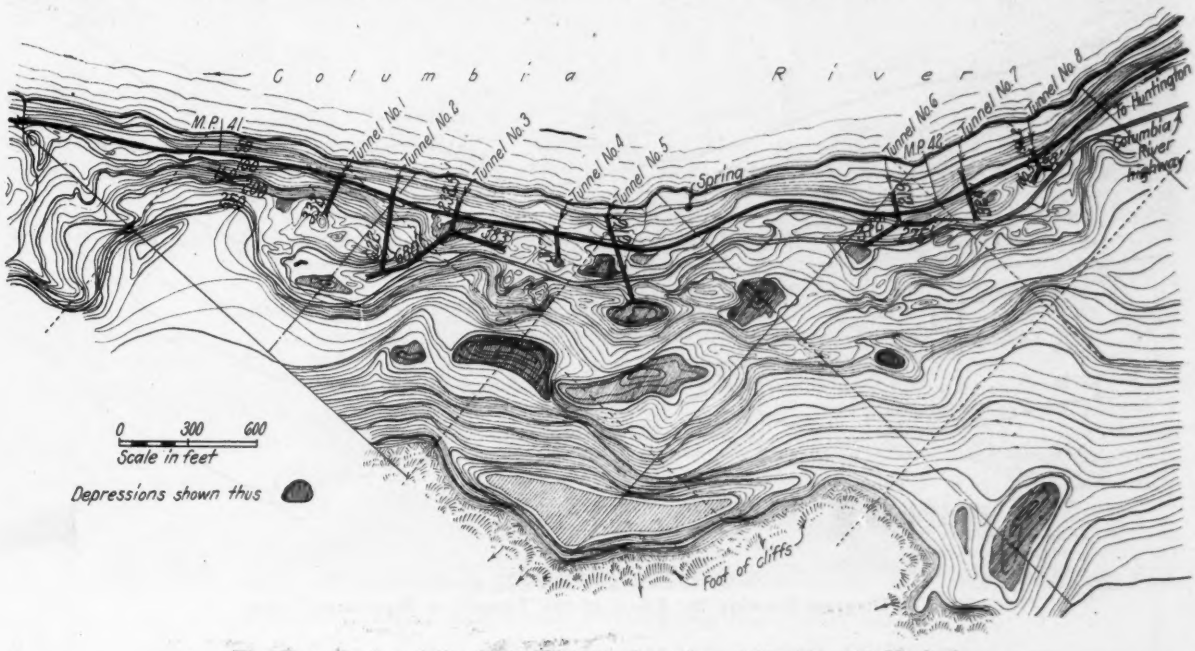
Both Sides of Gorge Show Movement

Investigations undertaken in 1917 with the hope of formulating plans for diminishing the movement were begun by careful examinations of the surrounding territory. The landslide lies approximately under the axis of the Cascade mountains and on the south side of the gorge which the Columbia river has cut through that range. Here the basalt walls of the gorge rest on softer conglomerates of considerable thickness which by their disintegration have caused the cliffs on either side of the river to recede until they are separated by a distance of three or four miles. The entirely valley floor is formed of stream deposits intermixed with debris from the cliffs and presents abundant evidence of instability, even to the superficial observer. Depressions and broken ridges complicate the contours; wide areas are covered with intermixed masses of conglomerate and lava among which streams lose themselves and reappear. On the steeper slopes fissures and the scars of recent slides are plainly visible. The entire width of the valley floor from cliff to cliff is covered by a heavy growth of Douglas Fir and if there were no other indications of movement, many large trees with sharply curved trunks and others leaning noticeably from the vertical would call attention to the instability of the ground.

Apparently the north bank of the stream has come to rest, but signs of activity are especially impressive between it and the northerly wall of the gorge. From portions of this wall a bombardment of falling boulders and fragments is almost continuous for periods of days or weeks.

The debris from the cliffs has crowded the Columbia river to the southerly side of the valley, and old slides from both sides of the stream have narrowed its channel and increased its slope. The Cascade rapids are probably the result of a slide from the south side of the gorge in relatively recent times.

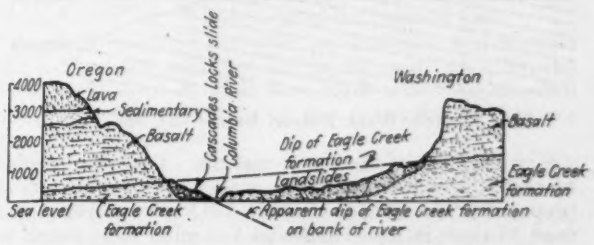
On the south bank of the river the conditions which created the problem, while similar to those on the north side, cover a smaller area and seemed less acute. The contours were so irregular and the growth of timber and underbrush so heavy that a reasonably accurate idea of the terrain could not be obtained until a carefully prepared contour map was made. Perhaps the most striking topographical feature is the depressions without surface drainage. The largest of these has an area of about 20 acres and a maximum depth of 60 ft. The walls of some of the smaller depressions not yet broken down and the older trees in them, standing dead among the thriving growth of saplings, were, with other evidence, a basis for the opinion that at least some of these depressions were of recent occurrence and probably the result of erosion beneath the surface and above the bed rock. The correctness of this conclusion was proved by later observations.



The Topography of the Slide With the Location of the Tunnels Marked

Many Springs Were Evident Along Slide

The effects of the slide had been experienced for a distance of about 1½ miles along the railroad. The slopes above this section of line, which presented ample evidence of instability, reach a height of 500 ft. in the distance of about 2500 ft. and rest against basalt cliffs which rise abruptly to an elevation of 4000 ft.

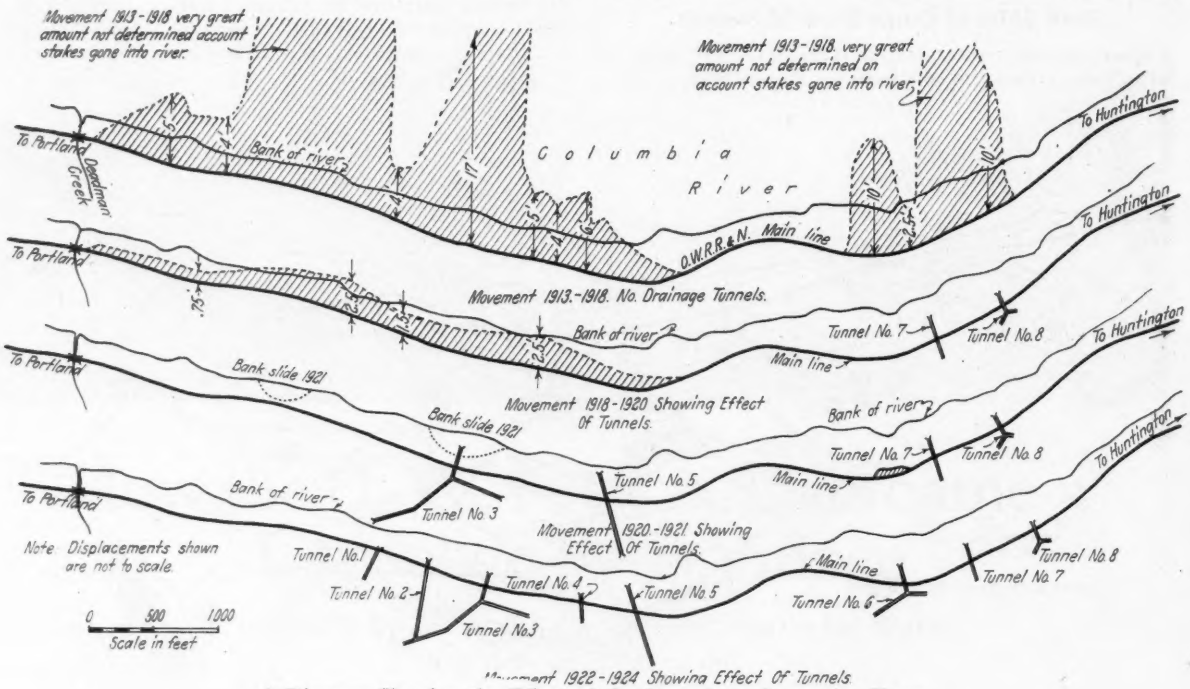


A Cross Section Showing the Geology of the Country

The unstable ground is composed of a porous debris of earth, boulders and lava fragments. It is supported on

soft stratified rocks, the Eagle Creek tuff conglomerates, which are visible below the high water stage of the river. These are intercalated with soft shales and clayey materials, are impervious to water and are very slippery when wet. Springs flowed over the surface of this rock at such close intervals that, in periods of very heavy rainfall, their discharge formed an almost continuous film of water for nearly two miles along the margin of the stream. The quired in preserving alinement and grade. Lateral movement was always accompanied by settlement, but settlement often occurred alone.

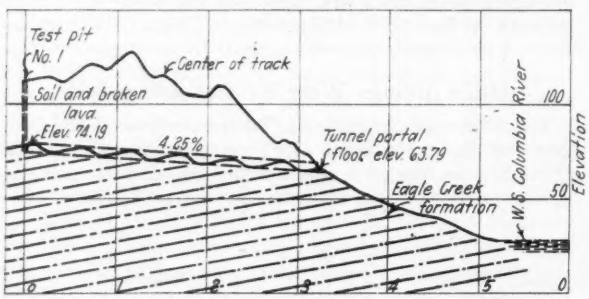
In pursuing the investigation further, shafts were sunk to bed rock south of the railroad grade. In some, water was encountered in quantities, while others were dry, notwithstanding large seepages that appeared along the adjacent river bank. The data obtained from these shafts



A Diagram Showing the Effect of the Tunnels in Successive Years

discharge seemed usually to reach its maximum in March, when the saturation of the slopes was at the maximum. The annual precipitation at track level is 78 in., most of it falling as rain. At the higher levels the precipitation is greater and snow is more common.

While movement of the roadbed had been experienced at all seasons of the year, the most troublesome period



The Tunnels Were Driven Below the Soil Layers

was at the close of the winter months. To obtain an idea of the rate of movement the stakes of a survey for a proposed grade revision made in 1913 were retraced and most of them in the distance of 1½ miles were found to have been shifted laterally. The maximum measurable movement in a period of four years was found to be 17 ft., but in three sections aggregating 1900 ft. in length no trace of stakes could be found. Some of them had been shifted 30 to 40 ft. when the bank broke off and carried them into the stream. The movement of these stakes will give an idea of the extraordinary maintenance re-

led to an analysis of the situation that is probably the important factor in the successful solution of the problem.

The Eagle Creek layers where exposed, seem to slope in the direction of the slide, downward toward the river. However, this rock is 1000 to 2000 ft. thick in the north wall of the gorge, while its greatest depth in the south wall does not exceed a few hundred feet, indicating a slope actually opposed to the direction of the slide. The apparent slope on the river bank has resulted from the bevelling of the layers by the erosion of the stream. Above the erosive action of the river, where the rock is protected by overburden, the edges of the strata present themselves in a series of ridges, the intervals between which, filled with porous material, acted as channels and reservoirs for the underground waters. The shafts sunk into the ridges were dry, while water was encountered in those which happened to strike the depressions between ridges.

Drainage Measures Were Undertaken

Notwithstanding the great area of the slide and the impression created by years of almost continuous trouble, the study indicated that treatment by drainage might be reasonably practicable. The alternating ridges and channels could be expected to supplement the drainage tunnels by increasing their effect laterally. Concentration of water in tunnels would reduce erosion beneath the ground surface and prevent sudden settlements of the track such as had been experienced, and stabilizing a sufficient volume of material at the toe of the slide would have the effect of a retaining wall pervious to water.

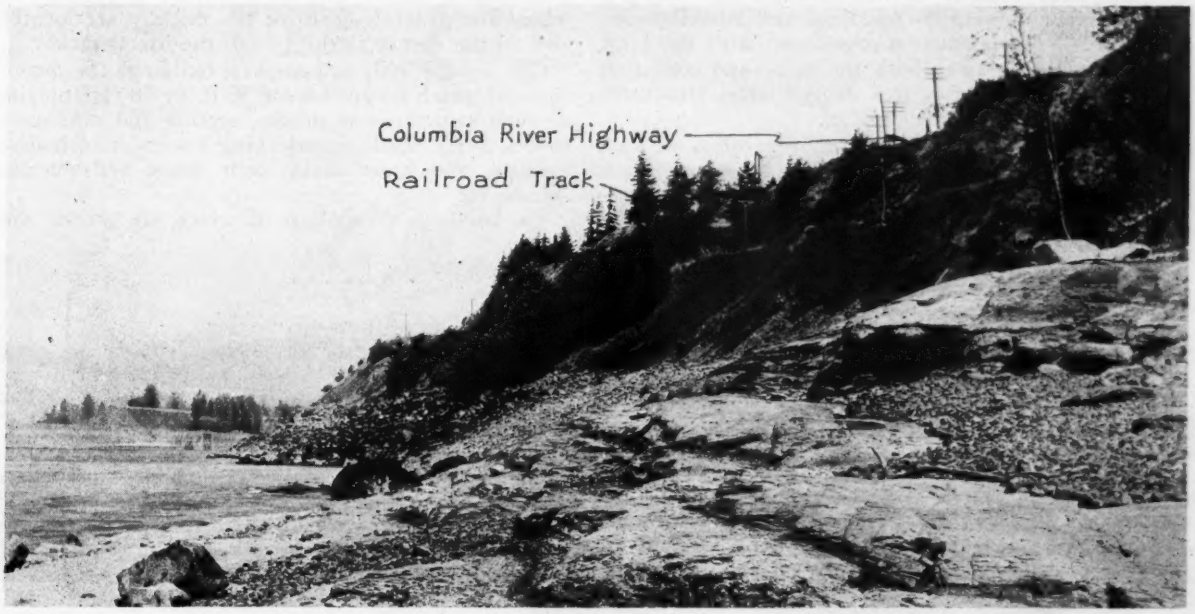
In July, 1918, a drift 4 ft. wide by 6 ft. high was undertaken near the easterly end of the slide where conditions were most acute and at a point from which a considerable flow was issuing. The drift was projected with the idea of intersecting the bottoms of the water-bearing channels. The channels were cut at intervals of 25 to 30 ft. and flows of water of 15 to 30 second feet broke forth, continuing in diminishing volume for two or three days in some cases. When this tunnel had been extended about 130 ft., a body of quicksand was tapped which poured out with a depth of 3 ft. at such speed that the miners were hard pressed in their retreat. Cavities were encountered which were undoubtedly the result of erosion and which ultimately must have resulted in surface settlement.

The effect of the work was so immediately beneficial that a second tunnel was commenced at a spring about 550 ft. west of the first tunnel. By the close of 1918, both drifts having been extended to lengths of 324 ft., work was suspended.

In May, 1920, when the work had received the test of two rainy seasons, surveys disclosed that the ground adjacent to the track along the westerly portion of the slide had been displaced about two feet, while no evidence of movement could be detected in the easterly portion which had previously been the more troublesome. In July of that year work was commenced on two additional tunnels, one of which was directed toward a pond lying approximately 500 ft. from the railroad, and which presented unusual problems. This pond discharged about 20 second feet through a flume, and the use of fluorescein dye proved that springs along the river bank found their source in the pond for additional flows aggregating about 25 second feet. It was planned to extend the tunnel to a point about 50 ft. vertically below the bottom of the pond, to upraise as judgment should dictate and then to tap the pond by a blast.

As the drift was extended an increasing flow was developed which reached a maximum of 60 second feet without apparent reduction in the discharge through the flume. The springs on the river bank, however, ceased to flow.

In order to protect the tunnel sets against the anticipated discharge from the pond the tunnel was sheathed with planking. After the drift had been carried the required distance and shortly after the upraise was commenced, a cavein occurred and the resulting flow taxed the capacity of the 4 ft. by 6 ft. drift. When this discharge had continued for 48 hours, caving ground shut off the flow. The lining for a shaft, 3 ft. square and 50 ft. high, was then erected in a depression which had formed in the bottom of the pond, and was guyed to trees. When the drift was again cleared, the waters effectively carried the lining down with them and landed it upon the tunnel timbers. The pond was emptied in about 24 hours. A heavy flow still continues to enter the tunnel, which has lowered the level of ground water at least 50 ft. over a large but unknown area.



Rock Out Cropping Near Tunnel Five Showing Eagle Creek Layers

In all, eight tunnels have been constructed with an aggregate length, including laterals, of 4674 ft. It has been found desirable to commence the heading at a visible flow and to follow it until satisfactory results have been obtained. Where no decided flow is in evidence, extending the tunnel toward a surface depression which indicated the probable location of underground flows, has been successful. The tunnels are lined with Port Orford Cedar (Lawson Cypress), a wood which combines strength with marked resistance to rot.

The results of the work are quite satisfactory. In January, 1923, during protracted heavy rains, the discharge from the tunnels totaled 350 second feet.

The movement of the track has gradually decreased as the work progressed and no displacement has occurred since the winter of 1920-21. Slow orders which were usually in effect for 100 days per year prior to 1918 are now seldom necessary.

Whether the tunnels have been carried sufficiently far to drain a mass large enough to retain the ground beyond them effectively and to insure permanent results may still be speculative. But observation indicates that lateral movement has been consequent on settlement due to underground erosion, and in no case where displacement has ceased during the six years of work has it recurred.

The entire project has cost about $120,000. The problem was analyzed by S. Murray, assistant chief engineer of the O.-W. R. R. & N., and the work was carried out under his direction by A. C. O'Neel, assistant engineer.

Kansas City Southern Adopts System of Numbering Buildings

Identification of Structures in Correspondence and Records Greatly Simplified by Specific Designations

FOR THE PURPOSE of affording easy and accurate means of identification, the Kansas City Southern recently devised and put into effect a system of numbering its buildings and miscellaneous structures. The system was adopted with the hope that it would do away with the delay and confusion present to a greater or less degree when structures were identified by name only.

Every building on the system, regardless of size, location or purpose for which it is used, is numbered. No distinction is made between buildings or structures of any kind, or between the departments using them, except that a larger letter and figure is used on shop buildings and no numbers are placed on cattle guards, farm fences, cinder pits, turntables, mail cranes, pen stocks, bridges and culverts.

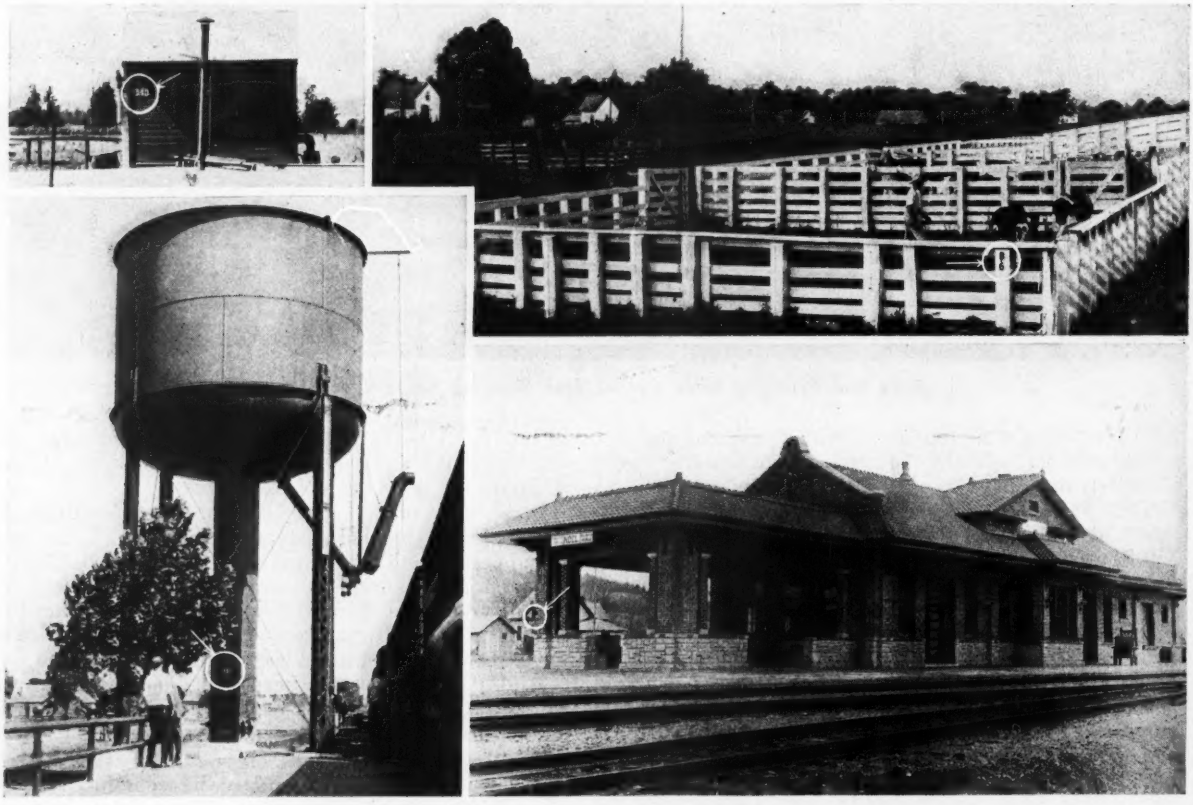
A four-inch Gothic letter and figure is used on all buildings and structures, with the exception of shop buildings where the size is increased to six inches. The numbers are applied by means of a stencil, black paint being used on buildings and structures having a light background, and white paint on those with a dark background. Each number is preceded by the letter "B" (for "building"), to distinguish it from any other number that might exist on a building or structure.

As far as practicable the number is placed on the building or structure, seven feet from the ground or platform, on the end nearest to Kansas City, Missouri, where the general offices of the railway are located, and on the corner farthest from the main track.

One number only is placed on buildings the dimensions of which do not exceed 50 ft. by 50 ft., applying to such structures as depots, section and outhouses, toilets, berry sheds, interlocking towers, tool houses, delivery and water tanks, scale house and pumping houses, etc.

On buildings dimensions of which are greater than 50 ft. by 50 ft. and less than 150 ft. by 150 ft., the serial number is applied in two different places. This applies to freight houses, office buildings and similar structures. On buildings with dimensions exceeding 150 ft. by 150 ft. the number is placed in four different locations, this applying to such buildings as boiler and machine shops, warehouses, etc.

A separate series of numbers is used in each town, each series starting with the number "B-1," which was placed on the first building or structure, and continuing in order south from Kansas City. Buildings or structures between stations are included in the number series of the towns in which they would naturally belong.



Where the Numbers Appear on Four Classes of Fixed Property

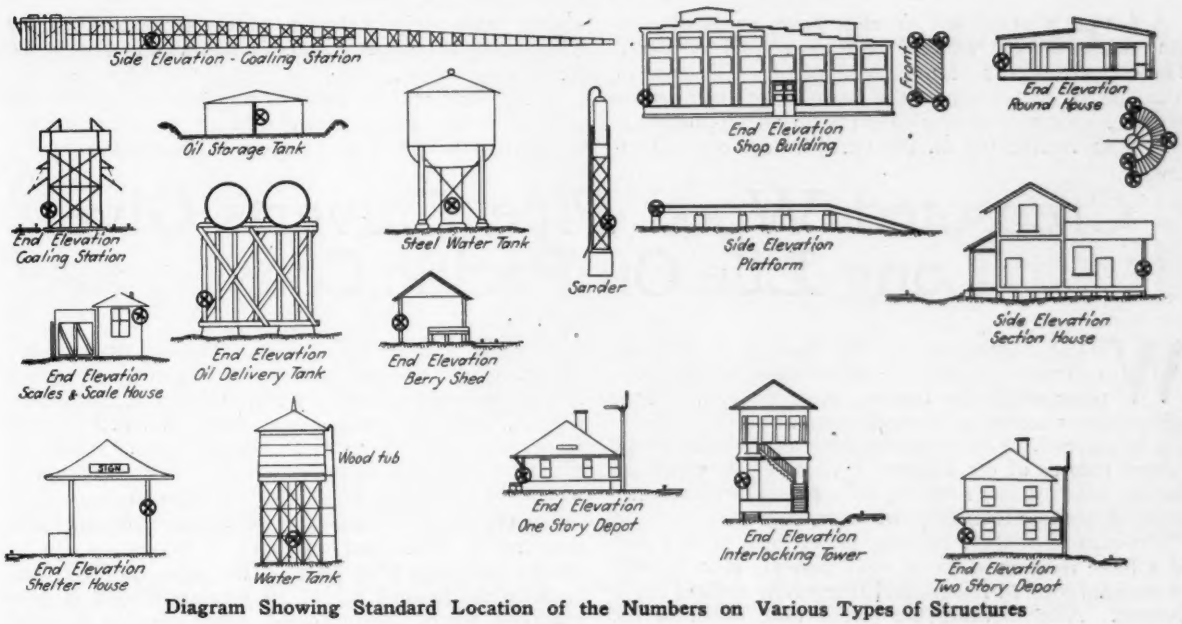


Diagram Showing Standard Location of the Numbers on Various Types of Structures

When a new building or structure is added in a town it is assigned the next number following the last used in that town. When a building or structure is destroyed or permanently removed its number is not used again unless the building is replaced, in which case it takes the number of the old building.

When a building is mentioned in correspondence, the name of the building, town in which located, and the series number, is given. For example, the coal trestle at Grandview is referred to as "Coal trestle, Grandview, B-6," the section tool house at Poteau as "Section tool house, Poteau, B-21." This makes identification positive.

To accomplish the initial numbering of the buildings and structures on the system a party was sent over the road on a motor car, starting at Kansas City. At the same time this party revised the fire insurance schedule on the ground and secured a photograph of every building or structure numbered. This party consisted of five men and included representatives of the chief engineer, the auditor and the superintendent of bridges and buildings. The fire prevention inspector and the roadmasters on their respective districts completed the party. These men painted the numbers on the buildings, took measurements and photographs, revised the insurance schedule and completed the building record.

In doing this work over a thousand miles of track was covered and 1981 buildings and structures numbered, measured and photographed. The tentative schedule made up in the beginning, which allowed five minutes to place each number, an average of 20 miles an hour traveling time, and 22 days for the completion of the work, not allowing for bad weather or delays of any kind, worked out to the day, in spite of some serious delays.

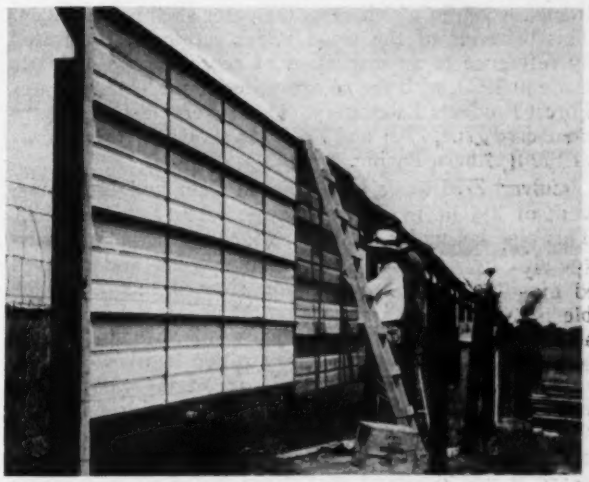
This system of numbering buildings was developed under the direction of A. N. Reece, chief engineer of the Kansas City Southern, to whom we are indebted for the information presented above.

Electrification Makes Progress—The Illinois Central has contracted for the electric power for its Chicago suburban service effective in 1926.

Determining the Painting Characteristics of Woods

A TEST FENCE is being erected by the United States Forest Products Laboratory at Madison, Wisconsin, to show which of the woods commonly used in outside construction will take and hold paint satisfactorily, which are difficult to paint, and how painting difficulties may be overcome. Nine other test fences are being put up in the various climatic regions of the United States.

As the investigation which is being undertaken is not for the purpose of comparing various paint mixtures, two paints only have been used. One of these is a Dutch process white lead in oil and the other a white lead, zinc oxide, and asbestine, mixed



A View of the Test Fence

pigment paint which is believed to be representative of a large amount of the high grade "ready mixed" paints on the market.

A flat-grain panel and an edge-grain panel of each kind of wood are coated with each kind of paint. Three coats of the paints are applied. The row of tilted panels at the top of the fence is for the purpose of comparing weathering of paint on an inclined surface with weathering on the vertical surfaces. Horizontal drain strips between panels serve to keep the pigment of the upper panels from washing across the lower ones.

After each coat of paint is applied to a panel, the painter weighs paint, can, and brush to determine the amount of paint required to coat the various woods.

Creosoted Wood Pipe Culverts Give Long Life On Pacific Coast

WHILE much data of one kind or another are available regarding the preservation of ties, poles, posts and bridge timbers, there is relatively little information concerning the application of preservatives to timber culverts. This condition adds to the value of the culvert records of the Portland division of the Southern Pacific, where a large number of wood culverts are still intact after more than 20 years' service.

The history of these culverts shows them to be a part of a large number of wood stave culverts built in 1896 of material secured from sound Douglas fir timbers cut in Oregon. After sawing, the pieces were taken to the Southern Pacific creosoting plant at West Oakland, Cal., where they were treated in a green condition by the "boiling process." The penetration was about ½ in. with an absorption of about 12 lb. of creosote per cu. ft. The material was shipped immediately after treatment and the culverts were installed between 1896 and 1902.

These structures were built up in circular sections of 2½ in. staves held by iron hoops and ranged from 18 in. to 36 in. in diam. They were installed from 1½ ft. to 18 ft. below the rail. Structurally, the culverts were not satisfactory, as they deformed considerably under load and collapsed in a number of cases. Most of the culverts, however, numbering about 35, after flattening a few inches, have remained in that condition without further deformation and are still in service.

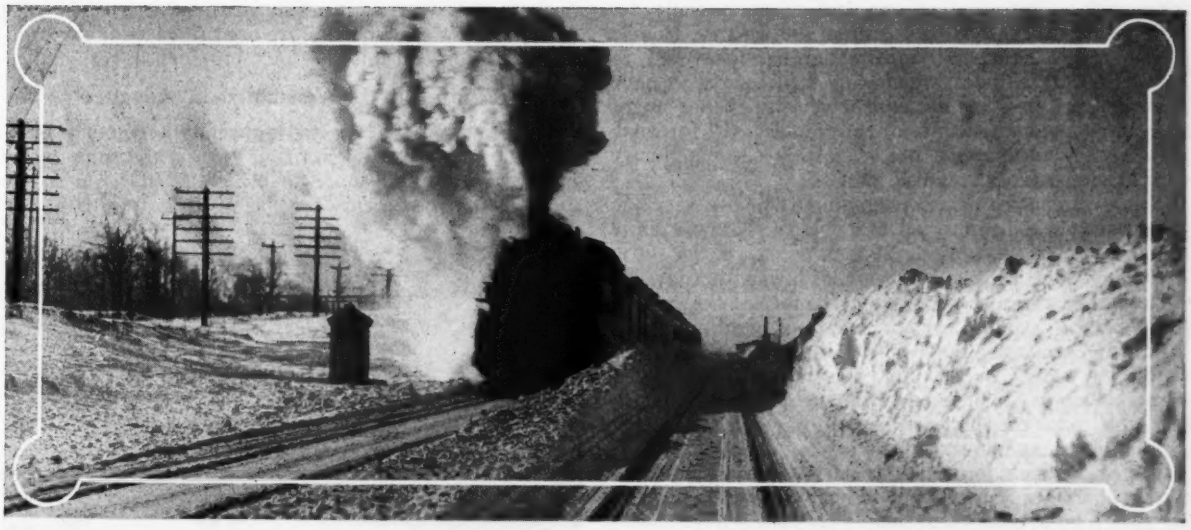
The significant thing about these culverts is that the difference found in the condition of these culverts on inspection is a structural one. Repeated inspections have disclosed the fact that the timber has remained sound in every case except where staves were cut, exposing untreated wood, in which cases the outer shell is still intact. This behavior of the wood under service is illustrated by reference to an inspection of representative culverts made in 1920, with the co-operation of the United States Forest Products Laboratory. The culverts inspected were numbered 770I, 770J and 770K, as shown by the records of the Southern Pacific.

Culvert 770I was a pipe 19 in. in diam. and 44 ft. long, built of 2½ in. by 2½ in. staves and installed in 1896. This pipe lay under a 20 ft. rock fill with the ends surrounded by damp clay loam, underbrush and decayed vegetable matter. Investigation showed that after the pipe had been placed in position the end at the outlet had been sawed off in order to square it up. Some of the staves from which the end penetration had been cut off showed decay in the untreated part of the wood. The treated portion, however, were found uninjured. After the end of the pipe had been squared up, a board had been nailed across it at the top. Upon removing this board it was observed that decay had developed where the nails had penetrated the pipe. The shoe on the band at the end of the pipe had broken and caused serious failures in the form of splits in two of the staves. Where the untreated wood was exposed in these staves decay had also developed. The side penetration in the staves appeared to average about ⅝ in. The end of the penetration could not be determined as in some cases it seemed to have been cut off entirely and in others it was impossible to determine exactly how much had been cut off from the length of the stave. The conclusions relative to this pipe were that in general it was in good condition where the untreated wood was not exposed.

Culvert No. 770K was also 44 ft. long with an inside diameter of 19 in. and was built of 2½ in. by 2½ in. staves, constructed in 1896. This pipe, however, was installed under an 8 ft. fill. It was also found in good condition where the untreated wood was not exposed. The pipe rested on a collar support which had been treated and this was also found in good condition. The ends of the staves in this pipe had also been cut off in order to square up the pipe. A small board that had been fastened to the end of the pipe at the bottom had broken off and it was found that where the nails penetrated the stave beyond the treatment decay had taken place. An adjoining stave from which the end penetration had been cut off also showed decay in the untreated part of the wood. A certain amount of debris was also found at the end of this pipe, which rested on damp clay loam. The general condition of this pipe, however, was better than that of pipe 770I, due principally to the fact that the staves had not been seriously injured by nail holes, breakages or cutting off the end penetration.

Culvert No. 770J differed from the previous culverts in that it was a box culvert 3 ft. wide, 4 ft. deep and 60 ft. long. The top and bottom were made of 4-in. by 12-in. and the sides of 3½-in. by 12-in. creosoted plank. A wing wall had been provided at the discharge end of the culvert, built of 2-in. by 12-in. creosoted plank. This culvert was lying under approximately a 20-ft. fill of sandy loam and was installed in 1896. Some underbrush and decayed matter was reported as having been found at the end of this culvert but the conditions were not as bad as those found in either of the two circular culverts mentioned. No decay was found in the culvert proper. The wing wall was also free from decay except where one of the planks had been sawed off after installation in order to improve the appearance of the culvert, this sawing having exposed the untreated wood and started decay. The inspection in all three cases was made at the lower end of the culverts where they projected from the fills, these points of inspection presenting most favorable conditions for decay. While these detailed observations were made at the time of the inspection in 1920, inspections made since found the treated wood still intact.

Because of their utility in furnishing positive data on the life of culvert material when treated with preservative, as well as in emphasizing the potential evil of injuring creosoted timber when in place, these structures are to be watched closely until failure. We are indebted for the above information to W. H. Kirkbride, engineer maintenance of way, of the Southern Pacific, Pacific System, at San Francisco, Cal.



How the Illinois Central Fights Snow In a Large Terminal*

A Description of the Preparations Which Are Made in Advance to Meet Winter Storms

By J. J. Desmond
Roadmaster, Chicago Terminal Division, Illinois Central, Chicago

THE freight facilities of the Illinois Central in Chicago include 21 freight houses fully equipped with platforms, etc., 183 industries with switch track connections, 60 team tracks with a total capacity of 859 cars, more than a mile of dock line for berthing boats and more than 300 miles of storage and interchange tracks. Approximately 180,000 freight cars are handled per month. Through passenger business requires 15 through stations with the necessary platforms and other facilities, roundhouses, train sheds, powerhouses, connecting tracks, etc. At the present time, 77 through trains are handled in and out of our Central station every 24 hours.

Suburban passenger traffic involves 66 suburban stations and 43 high platforms with walks, stairways and other facilities. A total of 401 suburban trains are handled to and from the loop every 24 hours. This service furnishes transportation to approximately 85,000 people daily, 50,000 of whom are handled during the morning and evening rush hours. The total transportation facilities of the Illinois Central in the Chicago terminals involve 600 buildings and 525 miles of track, with 2,174 ordinary switches, 85 double slip switches and 89 railroad crossings.

The efficient handling of snow and ice in a large railway terminal such as this is a problem worthy of very careful consideration from the operating vice-president down to the section foreman. After many years of experience in handling this work, we have developed a plan which works very satisfactorily.

A Detailed Organization Plan Is Prepared

Early in the fall a snow meeting is called in the roadmaster's office at which his entire staff, consisting of the heads of the bridge and building, track, water service, signal and engineering departments are present. This meeting is also attended by representatives of the transportation department in order that they will understand the plan to be followed and be in a position to co-operate properly with the maintenance department.

At about the same time, another meeting is held by the superintendent and his entire staff where plans are made for the location of snow plows and the assignment of snow plow men, the equipping of heater engines, etc., as well as the handling of snow plow crews, which details are taken care of entirely by the superintendent's office direct. These two meetings are called simultaneously to insure close co-operation between the different departments.

Before these meetings are called, lists are compiled showing the names, addresses and telephone numbers of every employee in the various departments who is considered competent to be used in a supervisory capacity in case of a snow storm. At these meetings definite assignments are made involving specific duties and exact locations with instructions that all men are to report for duty in case of trouble. The regular organization forces are, as far as possible, assigned to duties on their own territory and it becomes necessary to send emergency forces to their assistance only in case of severer storms. For instance, each section foreman is given instructions for the work within his section limits, such as cleaning out switches, removing snow and ice from driveways, platforms, etc., and he is instructed to notify the roadmaster's office immediately when he is no longer able to handle the work properly with his force.

In case of severe storms requiring emergency forces, a man stationed at Twelfth street headquarters dispatches all forces to the various points where assistance is most urgent. This man is of long experience and familiar with the entire territory and his directions are not inter-

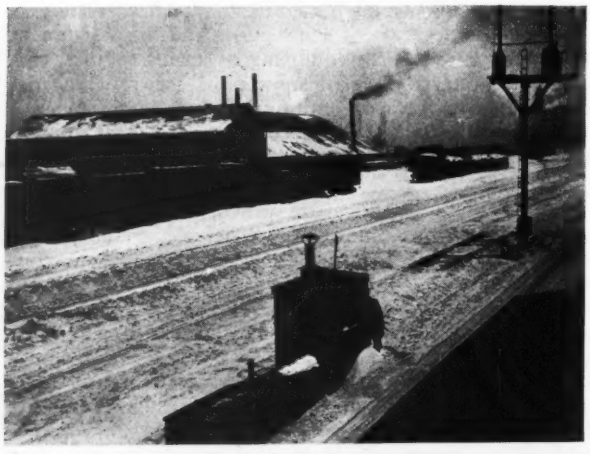
*Presented before the Maintenance of Way Club of Chicago on Nov. 11.

fered with. Operating officers and other specially assigned men travel over the terminal and in case trouble arises at any point, the information is dispatched to Twelfth street without interfering with men who have been assigned to other duties and who by chance might be in the immediate vicinity of the trouble. All foremen, both regular and special, are requested to communicate with headquarters at regular intervals.

This plan enables the Twelfth street office to have the situation well in hand at all times and to know exactly how many men are working at each point. If the storm is of long duration plans are made during the day for the assignment of a certain number of men at the various points on the terminal for the following night and careful arrangements are made to have laborers available to handle the work. In a similar manner the day force for the following day is planned by the night crew. We have been able to secure almost unlimited numbers of men in Chicago on short notice.

One of the most important problems in handling work of this character is to protect the payrolls when employing such a great number of men in so short a time. Some of these men work only a few hours and all have to be paid every day, which greatly increases this work. In order to reduce this work to a minimum, our management has agreed to issue an emergency time roll with the following instructions:

"These time rolls shall only be used in emergency cases, when necessary to pay employees after each day's work. The books shall be numbered consecutively each month, beginning with number one, in the roadmaster's office. The names shall be entered in duplicate by the use of carbon paper in the roadmaster's office before the gangs begin work and all information required should be shown therein, such as laborer's number, date, etc. The duplicate copy will be detached and retained by the roadmaster and the original, together with the book, handed to the foreman. The foreman will show in the columns headed "in" and "out" the time each employee begins and finishes work. At the close of each day the foreman shall sign the book in space provided as to the correctness of the time and transmit the book to the roadmaster's office. The total time worked by each employee shall be figured from the original copy of the time



A Snow Fall That Could Not Be Ignored

roll in the roadmaster's office and extended at the specified rates. The time worked, rates and amounts should also be entered on the duplicate time roll. The original copy of the time roll should be approved by the roadmaster, detached from the book and transmitted to the local treasurer for payment. The carbon copy is transmitted to the superintendent. An identification card will be issued showing the number of the book and the line which will not be honored unless signed by his foreman."

By the above method we have been able to handle the situation satisfactorily with a few men from the roadmaster's staff where previously many experienced clerks from various departments were used for writing pay rolls and confusion and mistakes quite frequently resulted.

Equipment Is Assembled in Advance

Immediately after the snow meeting previously mentioned, an invoice is taken of all tools in the snow house and requisitions are made to bring the stock up to the anticipated requirements for the winter. Ordinarily we

When the Importance of Trackmen Is Not Denied

have the following tools stored in the snow houses and ready for immediate use when the first snow storm arrives:

6,000 snow brooms.
2,640 scoop shovels.
2,000 No. 2 shovels.
275 picks and extra handles.
100 snow scrapers.
850 bags of rock salt.

This snow house is located at Twelfth street near headquarters and all gangs are required to return tools to the snow house each day.

Five snow plows are held in reserve at certain designated points and when it becomes necessary they are dispatched over the terminal in charge of men familiar with the territory. Careful checks are made in advance to ascertain all points not providing necessary clearances and in this way damage to platforms, walks, etc., is avoided.

We have found snow melters or torches of various types to be very effective in melting snow or ice from slip switches or switch points. In some places on the terminal we use and install regularly every fall, and take them out in the spring, regular steam snow melting devices, consisting of coils placed under diamonds and switches in large interlocking plants. We also equip a number of switch engines with valves and connections to their steam domes. Any one of these engines can be taken from yard service and placed on a siding provided for the purpose and hooked up quickly to these snow melting lines or coils of 1¼ in. pipe. We have two or three regular steamfitters assigned to this work and these men are called for service at the time the engines are ordered. We have also installed some concrete melting pits in which steam coils are placed. These pits have sewer connections and accumulated snow can be dumped or shoveled into them in heavy storms and the melted snow carried away in the sewers. These pits are located and are especially valuable in cramped points where there is no place to dispose of the snow or shovel it back from the tracks. They quite frequently relieve a situation

that would otherwise be very difficult to handle where the traffic is so heavy.

In order that one can see the possibilities of an organization such as this, I will describe what happened in 1918 and how our forces functioned then.

How the 1918 Storm Was Met

On New Year's morning, 1918, the worst snow storm in the city's history swooped down over the Lake district. In addition to our regular force, 178 special shovelers under 15 special foremen were sent out on January 1; 151 shovelers and 19 special foremen on January 2; 180 shovelers and 12 special foremen on January 3, and 90 shovelers under 6 special foremen on January 4 and 5. At 4:30 on the morning of January 6 the storm took a sudden turn for the worse, necessitating the dispatching of special men at once. The first gang left headquarters that morning at 6:15 and by 10:30 that night 660 extra men and 44 special foremen had been sent out. A short lull followed but at 1 o'clock the following morning, January 7, it was again necessary to send out additional help and by 1:30 p. m. of that day, 615 men were placed in the field. Gangs sent out after 6 p. m. were expected to keep the tracks open during the night and stay on the job until relieved by fresh men in the morning. Regular forces were divided as between night and day work in order to have forces familiar with the territory available at all times.

January 8 left us with a lot of snow on hand and still more coming. From 6 a. m. until 11 p. m., 995 men under 61 special foremen were dispatched from headquarters.

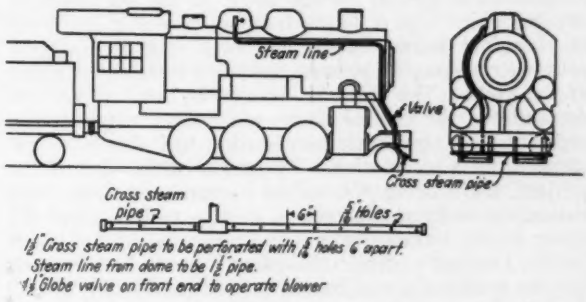
On January 9, 1,280 relief men under 60 special foremen were sent out to different points on the terminal between 5 a. m. and 7 p. m. On January 10, 1,155 men sent out; on January 11, 1,130 men out; on January 12, 575 extra shovelers were sent out but on Sunday, January 13, 1,575 men left headquarters between 2 a. m. and 9 that night. Approximately the same number were sent out on Monday, January 14. On Tuesday, January 15, 1,015 men were sent out and the same number on January 16. On January 17, 780 men were sent out.

We always desire to save the expense of snow trains but during this siege snow trains had to be used for about 12 days to relieve the situation as the snow falls were so steady and so heavy that removal by train was necessary. During the month of January, 15,018 extra men were used in digging us out of the snow.

Discussion

The presentation of Mr. Desmond's paper was followed by an animated discussion which brought out much additional information on the snow problem generally and the methods employed by the various railroads in meeting it. J. S. Robinson (C. & N. W.) reported that on the Chicago & North Western, about 1,200 men were required for removing snow during the winter of 1918. Staff meetings similar to those on the Illinois Central are held on the approach of winter and the work assigned in advance to avoid any confusion through misunderstanding during storms. Each roadmaster takes full charge of the work in his territory. All men are numbered and are paid off every day at points convenient to the work by special paymasters.

In answer to a question by James Sweeney (C. & E. I.), Mr. Robinson reported that the men have ordinarily been fed on the work but that during cold and stormy weather it has been the practice to serve hot coffee frequently between the regular meal hours. On the Illinois Central, according to Mr. Desmond, it has proved more economical to feed the men at nearby eating houses or restaurants, except where restaurants are not available, when coffee and sandwiches are served on the job. This part of the work is handled by establishing a reasonable price for the meals served and furnishing a statement in triplicate to the foreman, who goes with his men to the restaurant and after recording on the form the number and price of meals, sends a copy to the roadmaster's office, which is then checked against the bills submitted by the restaurant. E. D. Swift (Belt Railway) stated that it was his experience that in emergencies it proved best to caution foremen against being too particular as to the cost of the meal. This was particularly true in 1918, when special trains were required to maintain a constant flow of men to the work. Mr. Swift stressed the importance of providing proper tools and arranging for their proper distribution before storms. The Belt Railway equips all sections with chisel points for broom handles with which to remove snow from flangeways at crossings and between the stock rail and switch points when the snow is too wet to sweep out and considers it poor economy to furnish poor brooms for sweeping the snow. It was Mr. Swift's assertion, endorsed later by



The Way Engines Are Equipped for Snow Melting on the B. & O. C. T.

I. H. Schram (Erie), that the corn broom was to be recommended for snow work notwithstanding its additional cost. In complicated yards, such as are to be found along the lines of the Belt Railway, it was Mr. Swift's suggestion that special attention be given also to the prompt removal of all piles of snow accumulating around switches owing to the tendency of these to break the wind and thereby promote the formation of drifts.

Particular reference was made to the use of mechanical devices in snow removal work. There was a difference of opinion as to the advisability of using hydrocarbon, although all reports indicated that it was an effective method of removing snow and ice. This is the method used at Clearing yard, near Chicago, according to E. D. Swift, who stated that where it was the practice originally to draw the hydrocarbon from pipe lines extending from two 500 gal. tanks installed at the hump of the yard, the danger of this method has since resulted in the practice of drawing the oil direct from the storage tanks into three gallon cans. The use of hydrocarbon has been discontinued on the Chicago district of the North Western, according to J. S. Robinson, because of two bad accidents that resulted from its inflammability.

The spreader was also mentioned as having proved of distinct value in clearing terminal tracks, notwithstanding the temporary blocking of adjacent tracks resulting from its operation. While some doubt was expressed by several as to the advisability of depending on switch engines equipped with steam pipes for melting snow by reason of the danger of high pressure steam and the frequent inability to get the engines when needed, the experience of several roads established the fact that this method was proving very successful. P. J. McAndrews

(C. & N. W.) reported the equipping of one switch engine on the Chicago district of the Chicago & North Western last winter with steam pipes for this purpose at a cost of $35. T. H. Strate (C. M. & St. P.) reported that with switch engines equipped for using steam at 150 lb. pressure, as is the case on the Chicago, Milwaukee & St. Paul, the force of the steam is sufficient to dislodge as well as to melt the snow and ice. W. J. Harris (C. B. & Q.) said that on the LaCrosse division, where such switch engines have been used for several years, the engines can be depended upon to clear the track from 12 to 13 in. either side of the rail. It was the estimate of William Hogan (B. & O. C. T.) where a switch engine is equipped with the perforated pipe under the footboard it is equal to 35 men in removing snow.

The steam plant mentioned in Mr. Desmond's paper was further described by Charles Ettinger (I. C.) as consisting of 1¼ in. pipe coils installed between the ties under all slip and other switches in the vicinity of the Chicago passenger station. These coils are separated into nine units which units are again divided into four to six main divisions, thus avoiding any likelihood of a general breakdown if trouble should occur in the operation of any one unit. The coils are fed by a two-inch line from the terminal heating plant and each unit is equipped with a steam trap to prevent any accumulation of water in the coils. The plant is drained by air. Since the demands on the central steam plant have outgrown its capacity it is now customary during bad storms to get steam from a locomotive. By reason of the size of the project, there being 450 valves to open and close, it is customary to keep two men in service to look after the firing of the locomotive and the operation of the plant. In Mr. Ettinger's opinion this plant is not to be surpassed for the results it gives, having proved particularly useful during the storm that occurred two years ago at the beginning of the shopmen's strike, when it was impossible to get an engine on time to clear the track of an unusually heavy snow fall. On this occasion the turning of steam into the coils resulted in completely clearing away the snow and ice in the short time of two hours. The plant consists entirely of iron piping and while it has been installed for several years, no necessity has yet occurred for renewing any of the coils.

How a Section Foreman Plans His Work*

By E. W. Arnold

I AM in charge of three miles of double track, including several spur tracks, located west of Topeka, Kan. This is a busy territory. In order to keep this section in first-class shape with the money allotted the work is carried out according to a definite plan.

My first work at the beginning of the summer season is to get all joints oiled. I follow this up with the tightening of bolts. All culverts are cleared so that they will take care of the drainage from the spring rains. Importance is attached to getting all new ties inserted quickly and in order to start surfacing track out of face. I endeavor to surface as much track out of face as possible during the season, working on the places which are most badly out of line and surface first and then starting where the previous year's work left off.

After surfacing a mile of track out of face, I always drop back over this and pick up the low joints so as to keep a smooth riding track.

About the first of May my men are assigned to cutting a swath of weeds out to the edge of the shoulder, known as the first swath. The weeds are also cut from around buildings and bridges. Then the men go back to surfacing. About the first of August is general weed cutting time when all the weeds are cut on the right-of-way and from under all bridges and around all station buildings and stock yards. The cleaning of ditches follows the weeding. The ditch work is not neglected until this time

Foreman Arnold With His Men Near Topeka

in all cases, however, for the ditches that do not drain properly are opened at various times during the summer season.

A start is now made on winter work. The men are again put to oiling joints and tightening bolts, which work is done twice each year. It is important to keep the track up to good gage so this work is also done during this season, although the gage is watched at all times and the worst spots taken care of at once.

The right-of-way fence is put in condition and an effort made to remove all decayed posts and get the fence in shape so as not to be bothered with this work during the summer season. Crossing planks are renewed at highway and private crossings where needed. The right-of-way is burned off and a general cleanup is made over the right-of-way, picking up scrap which has fallen from passing scrap cars. This is in addition to the work of picking up the scrap along the track each day.

It is always a good plan during the summer to keep a close check for battered or other defective rail and to furnish a list to the roadmaster so that these rails can be changed out during the winter when there is more expansion at the joints and the work can be done with less cost and delay to traffic. It is also my practice to go over my section each working day and keep a close check on any soft spots, as well as inspect all frogs and switches. Constant attention is also given to see that the men place the tools on the motor car properly and that the car is operated to avoid a possible chance of accident.

*From the Rock Island Magazine, November, 1924.

Connaught Tunnel Lining—The lining of the Connaught tunnel, a structure five miles long situated beneath 6,000 ft. of mountain near Glacier, B. C., is gradually approaching completion. Nearly 500,000 sacks of cement will be required on the work, which is being completed in sections of 22 ft. long located at six different points in the tunnel. More than 100 flood lamps illuminate the work which progresses at the rate of about 132 ft. in six days.

Securing Proper Fire Protection For Timber Treating Plants*

A Discussion of the Recommended Practices and Equipment Necessary to Prevent Losses

THE fire loss experience in timber treating plants in the past has been good, considering the characteristics of the business and the extensive nature of the industry. The direct causes of the fires that have occurred have been open flames, electrical short circuits, gaskets blown out of oil lines, locomotive sparks, etc. Tie treating plants can be divided into two fire risks; first, the plant proper, comprising the cylinder or retort building, the boiler house, blacksmith, machine or repair shops, the wash and locker room, the office and store house, the oil storage tanks, etc.; and second, the tie storage, seasoning and shipping yard. The boiler house, repair shops, office, etc., are usually small detached buildings with no special equipment because of their serving a treating plant and have no unusual hazards other than those occasioned by their own occupancies. Their special risk is based on exposure by the tie storage yard and the retort or cylinder building.

Elements of Design and Operation

The unloading and storage of creosote oils does not involve any serious hazards inasmuch as creosote oil gives off little vapor at 100 deg. to 150 deg. F. and while stored the operator usually will keep the temperature of only one tank of oil up to this temperature in order to save steam. However, it is advisable to maintain about six inches of water on top of the oil in these storage tanks to act as a seal. If an underground unloading tank is used, precautions should be taken to see that steam locomotives do not pass over the unloading pit.

Vapors rise freely from the oil at treating temperatures and inasmuch as these vapors usually contain some of the lighter oils an explosion hazard exists where these vapors are allowed to mix with the air, particularly where confined within a building. It is, of course, important that these points be reduced as much as possible and that system which has the minimium number of such points is a better system from a fire prevention standpoint (treatment, penetration and cost equal) than one which has more such points. The proper design of cylinders, tanks, pipe lines, etc., so as to reduce the possibility of leakage or breakage is an important consideration. All floors should be properly drained and designed without catch-alls or sumps so that they can be cleaned readily and frequently and constant effort should be made to keep down the accumulation of oil on the floors, around the pumps, retorts or on the dock.

Electric Wiring Needs Special Attention

Special attention should be given to the electric wiring to see that the entire system throughout the plant is installed in accordance with the requirements of the National Electric Code. All lights in or about the retort building and creosote storage tanks should be equipped with rigid fixtures, vapor-proof globes, metal guards where necessary and outside switches should be used unless vapor-proof switches are installed. The use of open flame torches of any kind should not be permitted and only portable extension lights using reinforced flexible cable, vapor-proof globes and wire guards should be used. If electric power is used, no motors of the commutator type should be installed and all controlling switches must be located well away from creosote vapors or combustible dust. Proper care and regular inspection of all motors, bearings and machines is very essential.

The proper location and arrangement of the boilers is very necessary. These boilers should preferably be installed in a detached boiler house but if this is not feasible, the boiler room should be cut off from the retort or other adjoining buildings by standard parapeted fire walls, preferably without door openings. Good clearance should be provided between all woodwork and the boilers, their breeching and the stack and proper ventilation over the boilers and around the stack is essential.

No particular hazards are involved when coal is used for fuel, provided no large quantity is stored in the boiler room. When wood refuse is burned, proper stack screens should be provided and an ample clear space should be maintained on the floor in front of the fire doors. If fuel oil is used the installation should comply in all respects with the regulations of the National Board of Fire Underwriters for such apparatus.

The locker and wash room, blacksmith, machine or repair shops, etc., should be in separate buildings from the retort building or if adjoining, should be properly cut off therefrom. These structures, if of combustible construction, should be well separated from each other in order to reduce the exposure hazard to a minimum. Steel lockers should be provided for the men's clothes and proper provision made for drying them, other than directly on the steampipes.

Class and Type of Apparatus for Protection

In attempting to suggest the kind and class of fire fighting apparatus that should be installed in the plants under consideration, the general conditions surrounding the property, its size and construction, its geographical location and its location with reference to public fire departments and other facilities that might be available to assist in fighting fire, must all be given careful consideration.

When an adequate water supply from city mains is not available fire pumps of ample capacity and suction facilities should be provided. Standard six inch two-way frost proof fire hydrants, preferably with independent gate and national standard 2½-in. outlets should be provided and located on circulating water mains not less than 6 in. in size. Where the nearby city or town is not as yet equipped with national standard hose couplings it will be necessary to have all fire horse connections and couplings correspond to those of the adjacent city or town. If it is desired to use national standard couplings, the necessary adapters will have to be provided. These fire hydrants should be so located that all parts of the plant proper and the tie storage yard will be under the protection of at least one and preferably

*Abstracted from a committee report presented before the meeting of the Railway Fire Protection Association at Richmond, Va., on October 21-23, 1924.

two or more hydrants when not over 200 ft. of hose per hydrant is in use. The fire hose at the plant proper should be kept in standard, fully-equipped hose houses located over each hydrant. Such houses are preferable in the tie storage yard, but where necessary, portable reel hose carts, having not over 400 ft. of hose per cart and suitably housed, are permissible here, provided one reel is not supposed to serve more than three hydrants. Monitor nozzles, supplied by fire pumps of ample capacity, and so located that the nozzles are well above the tie piles and that all piles are under protection from at least one monitor nozzle, would appear to form a very satisfactory means of protecting tie storage yards.

Fire Extinguishers and Smother Jets

An ample supply of approved fire extinguishers, adaptable to the locations where installed, should be provided in all buildings and structures throughout the property and these extinguishers should be kept in readiness for immediate use at all times. For electrical fires, the 1-qt. or 1½-qt. carbon tetrachloride extinguisher is recommended. For oil or creosote hazard the 2½-gal. or the 40-gal. "foam type" is best adapted and for the protection of buildings and contents other than the above, the 2½-gal. soda-acid extinguisher or the 5-gal. pump tank, which can be made frost-proof, is recommended. Care must be exercised when installing all types of extinguishers, except the carbon-tetrachloride type, to protect them against freezing.

Steam smother jets, with remote control valves, are recommended for creosote and crude or fuel oil storage tanks. These jets should be not less than 1 in. in size and supplied by a 2-in. steam line or larger depending upon the number of jets installed. Suitable connections should be made to this supply line so that in an emergency one or more foam-type chemical engines may also be connected and discharged into these tanks.

Water Barrels and Pails

Even though a property is equipped with water lines and fire hydrants, it is desirable that water barrels, equipped with lids and at least two metal fire pails each, should be freely distributed throughout the tie yard and about the premises generally. These barrels and pails should be painted a distinctive color and should be labeled in letters of ample size "For Fire Only." These barrels should be kept completely filled at all times and the water therein treated to prevent freezing. Salt is recommended for treating wooden barrels to prevent freezing except where extremely low temperatures are encountered (below zero), when calcium chloride should be used. When making this non-freezing solution if the salt (or calcium chloride) is dissolved in hot water in the quantities specified by the National Board of Fire Underwriters, very little trouble will be encountered from freezing.

Storage or Seasoning Yard

When a plant is constructed if an orderly arrangement of buildings and material is insisted upon it will reduce the future fire risk very materially. When laying out new storage yards where prevailing and high velocity winds are encountered, the yard should be, if possible, laid out at right angles to those winds rather than parallel thereto. Timber should not be piled within 100 ft. of any building and the piles should not be too high (over 20 ft.). The tie piles should be broken longitudinally at least every 100 ft. by alleyways at least 10 ft. in width and where tie storage yards are long and extensive, fire breaks, not less than 100 ft. in width and extending entirely across the yard, should be provided at least every 1,000 ft. The end row of ties at these fire breaks should be piled solid to form a bulkhead and this end row should extend at least 4 ft. above adjoining piles.

Good fire roads are a necessity throughout the property in order to permit free action by the fire brigade and to facilitate the handling of the various apparatus employed. These roads should be designated by conspicuous signs and no obstructions should be permitted. All tracks should be planked to make proper crossings and all material should be so piled as to permit free use of such roads at all times. If steam locomotives or cranes are used in the yard for handling or piling, some sort of spark screen should be used on the stack.

Other Precautions

Good housekeeping is very essential in such properties and absolute cleanliness should be insisted upon. All dry vegetation should be removed and the entire yards covered to a sufficient depth with cinders or other inert material. No weeds, chips or decayed wood should be allowed to accumulate and the building of fires in or close to the tie storage yard to dispose of this material should be prohibited. Proper incinerators should be provided for this work. Where feasible and conditions warrant, the ground around the yard should be furrowed for a width of at least 10 ft. to prevent brush fires on adjoining property communicating to the ties.

Smoking throughout the entire property should be prohibited as far as possible, consistent with proper privileges accorded employees and the safety of the plant. Smoking should only be permitted at designated places such as locker and wash rooms, lunch rooms, etc., and then only at such times as proper supervision can be exercised. "No Smoking" signs should be posted freely and conspicuously and these signs should be of such a size as to attract attention readily.

Fire Brigades and Alarm Systems

The details of the organization of a fire brigade at any property will necessarily vary with the manner of operation of that property but where it is possible to do so regular brigades under competent fire chiefs, should be organized among both the day and night employees and drilled regularly. Where, due to insufficient forces, such fire brigades are not possible, all employees should be given periodic instruction and drill in the location and proper manner of handling all fire fighting apparatus, fire alarms, etc. As a means of promoting the necessary interest in such work some scheme of compensation, other than their regular pay, should be provided for all members of these fire brigades. When organizing private fire brigades, reference should be made to the pamphlet "Private Fire Brigades" issued by the National Fire Protection Association.

A modern plant fire alarm system, covering the tie storage yards as well as the plant proper, should be provided. Where possible and conditions warrant it this system should be connected automatically to the city or town alarm system and alarm gongs of ample size should be so located about the buildings that someone is always within hearing of at least one of these gongs. Where the private alarm system is not connected to the city or town system a city fire alarm box should be installed on the premises and conveniently located.

A code of fire whistle signals should be maintained and posted at the fire whistle and at various other

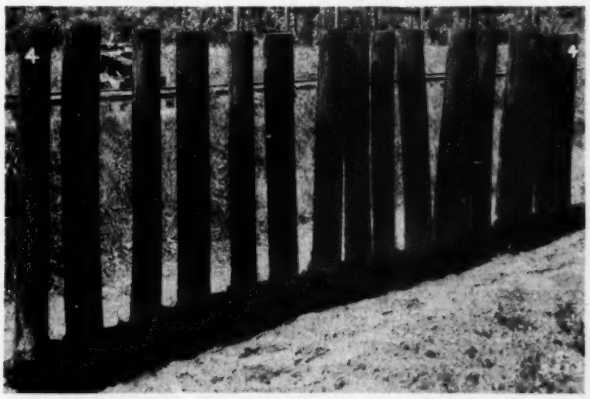
places about the plant, where the employees may readily see it and become thoroughly familiar therewith. The appearance of the painted code should be as conspicuous and attractive as possible.

Watchmen service throughout the property cannot be recommended too strongly. These men should make hourly rounds at nights and at least bi-hourly rounds on Sundays and holidays in the daytime and they should register on some approved time recording device, such as portable or electric watch clocks or preferably report through a central station supervisory service where this is available. Where clocks are used the watchmen should be required to report each round to the engineer in order to make sure that no accident has occurred.

Santa Fe Tests Efficiency of Treatment of Fence Posts*

TO obtain information on the relative life of untreated fence posts and posts properly treated with the standard wood preservatives—zinc chloride and coal-tar creosote—as well as brush treatments and treatments with various materials, the Atchison, Topeka & Santa Fe placed a number of southern pine posts along the right of way at Cleveland, Texas, in October, 1913.

Eleven posts were treated with 1.28 lb. of zinc chloride per cu. ft., using a 4.5 per cent solution and 10 posts were treated with 0.47 lb. of zinc chloride per cu. ft., using a 2 per cent solution. Seventeen were creosoted by the standard full-cell pressure process and 22 by a standard empty-cell process with a final retention of 5 lb. per cu. ft.



These Poles in Good Condition After 11 Years' Service

In addition, various numbers of posts were painted with coal-tar creosote, carbolineum, wood creosote and other substances; and other posts were treated with sodium silico fluoride and antinonnin in an open tank. These experimental posts were inspected in 1916, 1919, 1920, 1921 and 1924,—3, 6, 7, 8 and 11 years after they were placed in service.

After three years' service the untreated posts were found to be badly decayed, as were most of the posts that were painted with various substances and those treated with antinonnin. Those treated with sodium silico fluoride showed some decay in 3 years, additional decay after 6 years and were badly decayed after 11 years. The posts treated by the standard full-cell or empty-cell process with creosote and with 1.28 lb. of zinc chloride were all reported in excellent condition after 11 years' service. With but one exception the posts treated with only 0.471 lb. of zinc chloride were in good condition. The one unsound post began to decay after 7 years and was completely decayed at the ground line in 11 years.

Early in 1918, 30 southern pine posts were treated with 0.346 lb. and 10 with 0.479 lb. of ferrous chloride per cu. ft. and 32 with 0.89 lb. of copper sulphate per cubic foot. The 1924 inspection showed that the posts treated with ferrous chloride were checked and split to such an extent that, regardless of any preservative value this chemical might have, its use would be impracticable since the separation of the wood fiber is such that it would be difficult to keep staples in the posts. All posts treated with ferrous chloride were also very badly decayed.

Untreated Poles After Three Years

The posts treated with copper sulphate were also considerably checked and there were indications of a separation of annular rings in the sapwood. About half of these posts were in fairly good condition so far as decay is concerned, but the other half were badly decayed.

Four years ago there were also placed a number of Douglas fir posts treated by the empty-cell process with a final retention of 5.18 and 2.68 lb. of creosote per cubic foot and posts of the same species treated with 0.47 and 0.975 lb. of zinc chloride per cubic foot by the Burnett process. All these fir posts were in excellent condition at the last inspection after four years' service.

Zinc Treated Poles Intact After 11 Years' Service

This test clearly demonstrates the superiority of posts properly treated by the sandard pressure processes with zinc chloride or coal-tar creosote over those treated by other methods and with other materials.

*From Wood Preserving News for October, 1924.

Is Winter Maintenance Work Practical?

Railway Men Point Out That Much Can Be Done During Cold Weather to Reduce Summer Peak Load

THE stabilization of railway employment is now receiving more consideration than ever before. This trend is of particular interest to the engineering and maintenance of way department for it is here that fluctuations in forces are greatest and the difficulties to be overcome the most pronounced. As far as this department is concerned, this movement has for its object the redistribution of work so far as is practical to eliminate or reduce the wide fluctuations in forces which now occur so generally from month to month and from season to season and at the same time to secure constructive work from the men employed during the more adverse season.

Central of Georgia's Statement

The interest of railway managements in this subject is indicated by a statement which was issued by the Central of Georgia on October 28, from which the following paragraphs are taken:

"The desire of every man who works is for continuous employment at a fair rate of pay. These factors are of equal importance. High wages mean but little if employment is irregular and if the workman has long periods of idleness sandwiched in between brief periods of employment.

"Anything, therefore, that looks toward regularity of employment is of real interest to railway employees, their families and their dependents. A committee of railroad presidents has been appointed by the Association of Railway Executives to make a thorough study of the question of stabilizing employment and thereby eliminating 'ups and downs' or 'peaks and troughs' in railroad work.

"From the very nature of the business, fluctuation in the number of employees is inevitable in railroading. When traffic falls off or when inadequate rates result in insufficient revenue, railroads are compelled to curtail purchases and to reduce forces. The 'lay-off' is dreaded by railway labor and equally by railway management. To the men it means the stopping of the pay check; to the management it means the disruption of a skilled working force.

"The question of stabilizing employment is not a new one to the Central of Georgia. The management has at all times endeavored to provide regular employment for its men. Its success is indicated by the figures for the first 9 months of 1924. The number of employees in the shops of the railroad shows a variation this year of a little less than 3 per cent between the low month and the high month. The monthly variation in the number of clerical and general employees is less than 4 per cent. There is a slightly greater variation in the maintenance of way and transportation departments, but of all employees of the railroad only 7 per cent fewer were employed in the lightest month than in the heaviest month.

"It is a matter of importance to the men that they need not live in fear of being laid off, and it is important to the management to keep the forces intact, thus avoiding labor turn-over, the loss of experienced men and the breaking in of new men. Stabilized employment means increased efficiency."

While it may be said that such a program may be practical for a road located in the south, the two articles which follow indicate that it is also practical on the more northerly railroads. These articles are presented because of their timely interest to maintenance men, many of whom are confronted with more than the usual amount of uncompleted work and are facing a busy season next year.

Keep Winter Forces Constructively Employed

By G. L. Moore
Engineer Maintenance of Way, Lehigh Valley

Anxiety to perform all constructive work possible in the winter is not based primarily upon a desire to carry an unusually large force through the winter but to use such force as is carried through the winter on constructive work. While carrying a fairly good working force through the winter will, in giving the forces more uniform and continuous employment, have some effect in securing the services of employees of increased efficiency, this should not be overestimated, especially so far as track forces are concerned. It has not been an unusual experience in times past after carrying forces through the winter to see them go to other employment in the spring for a slight increase in the rate of wages.

I am a firm believer in doing all of the constructive work possible in the winter so as to relieve the summer forces and allow them to accomplish more work during the summer of a nature that cannot be performed in the winter. I am actuated in this also by a desire to avoid the wasting of the energies of the forces in the winter by not providing constructive work for them to do.

I have seen our forces gathered together on more than one division laying new rail on a winter's day when snow was falling. I know that if they had not been engaged on some such constructive work every man would have been sweeping or shovelling snow on that day. The road must be kept open; switches must be kept clean of snow and ice for operation, but any money expended unnecessarily for turning over snow flakes accomplishes nothing. One might just as well deliberately throw away the money so expended, for that is actually what he does.

In laying new rail in the winter, we pick up additional available forces at or near the point where the rail is laid for three or four days only or during the time the laying of the rail is under way, although over 90 per cent of the men employed in laying new rail are the regular forces carried through the winter to take care of the ordinary winter work and of emergencies.

For the last 15 years we have endeavored to lay all of our new rail in the winter and have generally been successful. The very few failures to accomplish this entirely has been due to inability to get the entire deliveries of the new rail from the mills in time. If a greater amount of new rail is to be laid in the winter than can be handled by the ordinary forces carried and the available men to be temporarily employed at or near the site of the work, it would pay to keep on more men to be sure to get the rail all laid and not lose time in laying it after the frost is out of the ground.

In connection with rail laying, a very considerable amount of good work and an item of importance to accomplish before the opening of the summer season is to adjust the bearing of the rail where necessary and gage the track accurately. This will put the track in shape ready for the running surface, which it should be given to make good track as soon as the frost is entirely out of the ground. If this adjusting and gaging is not done in the winter it will be necessary for gangs to do this work ahead of the surfacing gangs to put the track in shape to permit the surfacing gangs to do their work with the greatest efficiency and economy.

It is just as important to relay the relayer rails released by the new rail in branches, yards and sidings ahead of the summer work as far as possible. Heavier switches and frogs can also be laid in yard leads to good advantage during the winter.

We use steel fence posts, eliminating the necessity for digging post holes, and have no difficulty in accomplishing a great amount of fencing work in the winter. There is also much work in the bridge and building department that can be accomplished economically in the winter. In general, however, I do not hold to the idea that unusually large forces should be employed during the winter because I am sure that by doing so a great deal of money will be wasted puttering around in the snow.

Winter Bridge Work Is Practical

By Philip George Lang, Jr.
Engineer of Bridges, Baltimore & Ohio

The winter months were, until quite recently, characterized by the almost entire cessation of construction operations. Plant and equipment were laid up and organizations disbanded, although the carrying charges on the investment in plant and equipment, the maintenance of equipment and the cost of skeleton organizations continued. Since there was no escape from these charges, it was necessary that they be accounted a part of the overhead cost of work done during the remainder of the year.

Labor, both skilled and unskilled, has been subjected to the disorganization incident to part-time employment. When work was resumed it has been necessary to recondition and reassemble plant and equipment, and reorganize the field forces, and this entailed additional expense. Work of a periodical nature complicates the labor situation. Reliable and efficient workmen, skilled and unskilled, naturally display a reluctance to associate themselves with a class of work in which their earning period is restricted to a portion of the year. Under such conditions, worth-while men will gradually obtain positions where employment is continuous throughout the year, with the result that the best workmen cannot be secured for industries which offer only part-time employment.

Considerations of the foregoing character have in recent years undoubtedly been the underlying cause of the general extension of the working season to include the entire 12 months of the year. While this lengthening of the construction period has been of benefit to the employer, enabling him to retain organization and equipment intact and active throughout the year, and to obtain the advantages due to continuity of work and resulting decrease in cost, its benefits to labor and to the general public have been no less marked.

If work is to be carried out only during certain months of the year, then, in order to secure what may be termed a full year's work, operations must necessarily be rushed. Such a condition is decidedly unfavorable, since work which is pushed beyond a certain limit involves a cost which is altogether disproportionate to the advantage gained by the increased rapidity of completion. Where large jobs are undertaken which cannot be finished in one working season, the cost of the winter shut-down must also be taken into account.

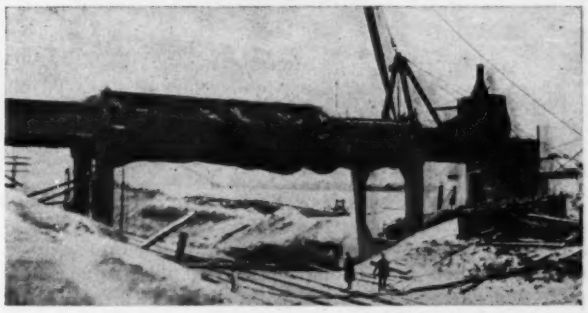
Under the condition of general prosperity which now exists, and probably will continue, the labor supply is sparse, not only because of the scarcity of labor, but due to the natural ambition of men to advance and to avail

A Highway Bridge Built Entirely During Winter

themselves of the numerous and varied channels of gainful employment, continuous throughout the year, which the industries of the country afford. Under such conditions, it is necessary to bend every effort to insure continuous employment.

The Added Cost Is Small

Apprehension which exists that the possibility of tie-up due to extraordinary weather conditions may be reflected in excessive costs of winter work is largely dispelled by the actual experience of four winter seasons, which indicates that such delays are neither more numerous nor more protracted than those en-



Steam Pipes Within a Tarpaulin Kept the Frost Away

countered during the months which formerly constituted the sole working season. This observation is confirmed by the general trend of prices on work to be prosecuted during the winter, which have not been in excess of those for similar work scheduled for performance during the summer. Relatively small expense, combined with proper forethought and care in the prosecution of the work, will permit the uninterrupted progress of construction under winter conditions.

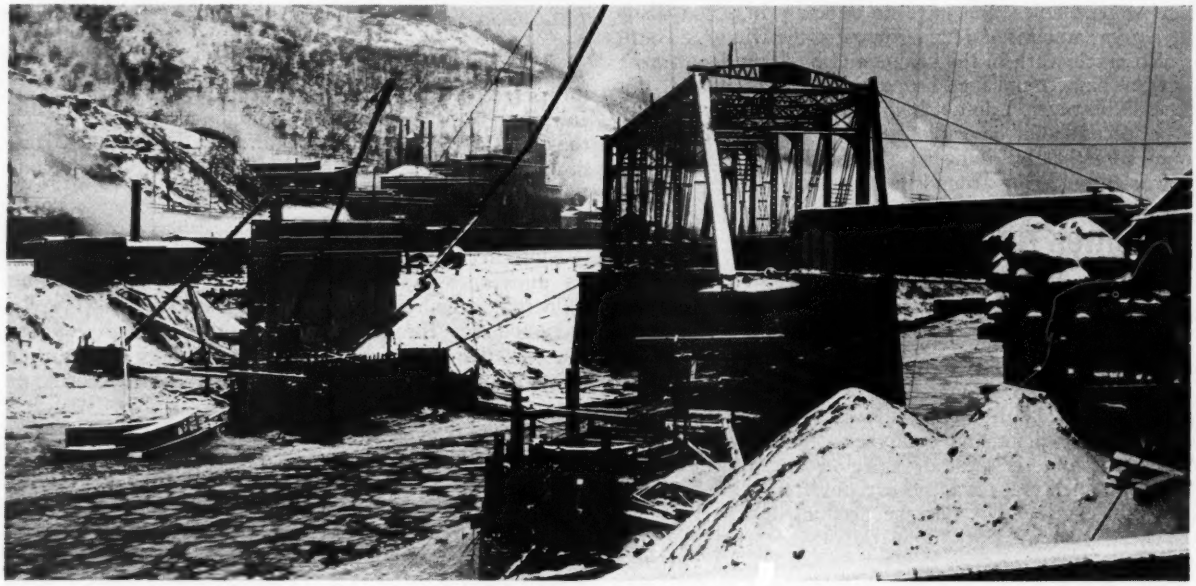
Railroad bridge work has almost invariably a close association with questions of operation, and the reconstruction of bridges in such form as to extend the operating limits of heavier power is a source of efficiency. Therefore, in practically all cases of railroad bridge construction, it is desirable that the work be completed at the earliest possible date, since its benefits cannot be obtained until it is finished in its entirety.

While admittedly work in extreme cold weather imposes some degree of hardship upon the personnel and methods of construction, it presents no obstacles which cannot readily be surmounted. Ordinary false work

required in connection with the removal of existing structures and the erection of new structures to replace them, as well as work incident to the removal of existing steel structures and the erection of new steel structures, can be prosecuted under practically any atmospheric temperature conditions.

B. & O. Does Much Work in Winter

The most serious problem in connection with winter construction is that of mixing and placing concrete, and protecting it from the action of cold during its setting period. This can only be effected by the application of heat and the maintenance of such heat until the concrete has set. In large bridges where great masses of concrete are utilized in the substructures, and in other bridges, where comparatively thin slabs are used in the floor of the superstructure, it is absolutely essential that the concrete be of the best quality. Such conditions presented themselves and were successfully met during the progress of work on two very large bridges on the Baltimore & Ohio.



The Baltimore & Ohio's New Bridge Over the Allegheny River, the Substructure of Which Was Built During Winter.

One of these was the bridge crossing the Allegheny river, at Pittsburgh, Pa. Work on the substructure of this bridge was commenced during the early autumn of 1919, and proceeded continuously to its termination in the spring of 1920, experiencing no interruption during the exceptionally severe winter of 1919-1920. Approximately 26,100 cu. yd. of concrete was placed at this point. The other bridge in question crosses the Great Miami river at Lawrenceburg, Ind., about 15 miles west of Cincinnati. The substructure was built during the winter of 1920-1921, and contains approximately 19,000 cu. yd. of concrete. No extreme difficulty was experienced in continuing operations at either of these bridges, and it is evident from subsequent results and observation that, although the major portion of the concrete was placed during cold weather, it is as serviceable as that placed during the summer.

During the winter of 1920-1921 three other bridge jobs on the Baltimore & Ohio were undertaken and completed. The winter of 1921-1922 witnessed the performance of work on 4 bridges, and during that of 1922-1923 work on 16 bridges was handled to a successful conclusion. Fourteen jobs of this character were performed during the winter of 1923-1924.

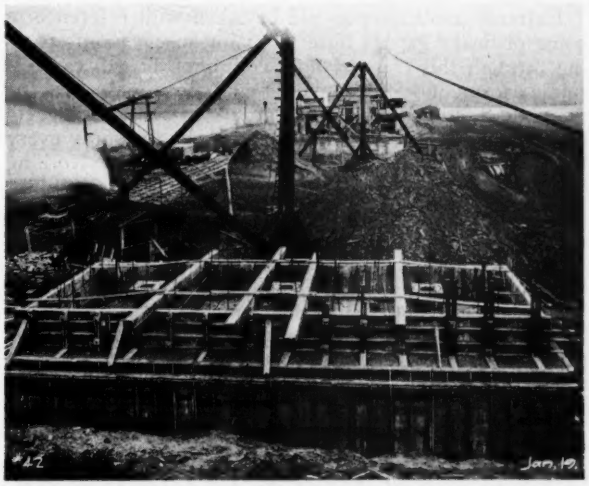
The work was distributed over a wide area and prosecuted under a variety of weather conditions. A deck plate girder bridge with concrete slab floor was built during a period of extreme low temperature. In this case the materials entering into the concrete were heated prior to mixing. Salamanders were placed below the slabs and between the girders and these kept the concrete at the proper temperature. Tarpaulins were placed above the slab and small holes were placed in the slab, so that the heat from the salamanders below could pass through, but would be retained by the tarpaulins.

An overhead highway bridge consisting of three girder spans encased in concrete, supported on concrete bents and having a concrete floor, was built during winter weather. In this case, when the concrete was poured, the entire structure was wrapped in tarpaulins, ordinary steam pipes run within the enclosure, and the concrete maintained at the proper temperature.

Another case was that of a double-track through plate girder bridge with a concrete floor, crossing a proposed roadway, the work being incident to the elimination of a grade crossing. At this point the concrete was poured after the materials had been heated, and the heat was retained by covering the concrete. From the girders tarpaulins or shelters were extended to the ground, and open fires maintained under the structure.

Work done during winter includes the remodelling of piers and abutments, this work consisting principally of the removal of the bridge seat courses and backwalls and their replacement in concrete. Ordinary steam pipes have been run close to the forms, and the entire work, that is, the forms, concrete and steam pipes, covered with tarpaulins or timber, and the heat thus maintained. In one case a masonry bridge pier was extensively remodelled and repaired with concrete in severe weather. At this point the entire work was enclosed with wooden housing, the concrete poured and heat maintained by the use of steam pipes.

It will be seen that all of the foregoing measures are of extremely elementary character, and may be varied or elaborated to serve the needs of each individual case. No defects have become apparent in the work prosecuted in this manner, and all indications point to the fact that, beyond doubt, such work is in every respect as good and satisfactory as that done under less rigorous conditions. Further, none of the measures adopted to secure good work have entailed excessive additional costs; indeed, the expense of precautionary measures has been very small.



Sinking a Bridge Pier in Winter

This work has been done under the following brief specification, concerning the interpretation of which no difficulty has arisen:

"The quantity of water used in mixing concrete shall be the least amount that will produce a plastic and workable mixture, which will flow into the forms and around the reinforcement. Under no circumstances shall the consistency of the mixture be such as to permit separation of the coarse aggregate from the mortar in handling. Excess of water will not be permitted, as it seriously affects the strength of the concrete, and any batch containing such an excess will be rejected.

"The contractor will provide all necessary materials and equipment and make all necessary arrangements to protect the concrete properly, so that it will not freeze in the event that freezing weather is encountered. The aggregates and mixing water shall be heated, so that the concrete, when placed, will have a temperature of not less than 70 deg. Fahrenheit. The concrete shall be placed in the forms immediately after mixing, so that none of its heat will be lost. Canvas covering or sheathing shall be provided. Where work can be enclosed, steam coils, open coke stoves or salamanders may be used for heating. Forms shall not be removed until the concrete is strong enough to bear load. The concrete shall be tested by pouring hot water on it, or by heating it in some other way, to be sure that it has hardened and not frozen. In severe weather, protection shall be continued for at least five days."

Mechanical Painting Reduces Costs*

THE development of the spray machine for paint and varnish application was due primarily to the great demand placed upon the painting industry by wartime activities and the necessity of increasing the available means for paint application. The shortage of men capable of wielding brushes soon became apparent and the great speed demanded in production developed as a vital factor. The success of spray-painting of war equipment paved the way for its use in peace-time practice and the satisfactory results obtained by many firms with the use of the spray machine have clearly demonstrated its practicability, economy and value for upkeep painting.

Spray painting equipment for upkeep work comprises two units: The air compressing unit which consists of the air compressor, air receiver, motive power and accessories, supplied in both portable and stationary types; and the spraying unit which consists of one or more paint guns, material containers, regulating and air cleansing means, hose, and other accessories. The paint guns are of two general types, namely, the attached cup or jar type and the separate container type. The former is used mainly for spraying manufactured articles in a fixed booth. The latter type is employed for painting in general. It has both fluid and air lines leading to it. The paint or other material is in a separate container and is forced to the paint gun through the fluid hose by gravity or air pressure. The air for atomizing the paint and shaping the spray is led directly to the paint gun through the air hose. Both the flow of the air and the paint can be adjusted so as to control the amount of material applied and the degree of atomization employed.

The material container for use with the separate container type of paint gun ranges from 1 to 50 gal. capacity, and may be of either of two types. The gravity type is used exclusively for stationary service in situations where the article to be coated is brought to a booth supplied with exhausting equipment for taking off excess vapors. It is mainly used for finishing manufactured products. The pressure type material container consists of a suitably constructed tank easily accessible for cleaning. This container has either a bolted-on or a screw type head and is fitted with a diaphragm regulator that controls the amount of air pressure used to drive the material through the fluid hose and also the air employed for atomizing purposes. The container is equipped with either an air or a mechanical agitator for preserving the mix of the material.

Correct Regulation of Air Pressure

An important factor attendant upon the success of spray painting is the correct regulation of the air pressure and the flow of the material. Too great an atomization pressure causes waste and over-aeration of the material that is being applied. This is frequently the cause of a defective finish. To take care of this condition, air purifying, straining and regulating devices are employed. The proper amount of air pressure to be used in connection with spray-painting is very hard to determine, owing to the fact that various materials require a variation of air pressure, and no set rule can be given. Just enough air pressure should be used to cause the paint to flow freely through the hose to the spraying machine. When working on the ground, a pressure of from 5 to 10 lb. will be found sufficient to force the average material through the hose, and from 35 to 45 lb. to atomize the paint at the nozzle.

Too much air pressure on the paint will force more material through the nozzle than can be atomized properly, which results in sags and unnecessary weight in material. The proper distance to hold the machine from the surface to be coated has been found to be from 6 to 8 in. The thickness of the coats of paint applied can be varied at the will of the operator. As in all painting, the

*The first of two articles abstracted from a chapter on spray painting from the book entitled "Principles and Practices of Upkeep Painting," edited by Roy C. Sheeler and published by E. I. DuPont deNemours & Co., Inc., Philadelphia, Pa. The second will follow in the next issue.

inexperienced spray operator has a tendency to apply a heavy coat. It is necessary for him to use extreme precaution and to see that the adjusting needle valve on the spray is constantly kept tight, allowing only enough air pressure on the paint to cause it to flow freely at the nozzle.

It is just as necessary to have a variety of sprays and nozzles for different kinds of work as it is to have different styles and sizes of brushes. The equipment of nozzles and sprays, as given by the following code, is the same for any make of spray machine. For the application of ready-mixed paint J—large spray; K—small spray; A—size of nozzle in diameter 3-16 in.; D—0.081 in.; E—0.070 in.; F—0.0465 in.; FF—0.055 in.

The most important things to observe in the application of ready-mixed paint are the size of the nozzle, the paint and atomization pressure and the size of the air compressor. The average spray requires approximately 6 cu. ft. of air per min. Any compressor which has a cylinder smaller than 3½ in. by 3½ in. will not give a sufficient amount of air for spraying. Strain all material before spraying. An atomization pressure of 45 to 50 lb. should be used on the priming coat and 50 to 60 lb. on the finishing coat. The J spray with an E nozzle is recommended for the priming coat and a K spray with an F nozzle for the second coat. Surface conditions present certain problems which require very careful consideration. Where a surface is very badly weather-beaten and the cracks are extremely large, it is almost impossible to fill them with the spray alone. However, by using the spray and brush together and applying the primer with the machine and then working the brush over rapidly, all the weather-beaten cracks can be filled perfectly. This process requires but a very few minutes of extra time.

Preventing Paint From Crawling

In preparing ready-mixed paints for priming work, reduce with a mixture of raw linseed oil and turpentine, two or three pints to the gallon of paint, varying the relative amounts of the two liquids to meet the requirements of the surface. Do not use too much oil in the priming coat, as this will cause it to dry with too high a gloss. It is absolutely necessary that the priming coat be flat and that no gloss spots appear before the second coat is applied. During the early spring and fall, paint has a natural tendency to "crawl" where any gloss spots are showing. These are easily taken care of if the second coat is brushed, but with a paint spray more difficulties are encountered. That is one reason why the priming coat should be strictly flat. If the case is one where there is considerable gloss showing in the priming coat, and the spray operator is having difficulty in keeping the paint from crawling, he may overcome this trouble by spraying a very thin coat of turpentine or benzine over the gloss surface. If this will not stop the trouble, a damp cloth rubbed over the gloss spots will do the trick. He will then be able to apply the second or finishing coat perfectly.

The second coat should be applied as the paint comes from the container, a very thin coat being applied. An extra heavy coat will cause crinkling and the result will be that it will have to be burnt off in a very short time. Two thin coats are better than one thick one. Naturally, however, in using the spray, it is advisable to produce the desired results with the application of the fewest number of coats possible. On inside painting, one spray coat of flat white is equal to two brush coats. Because of a greater uniformity with the spray method of application, the freedom from alternate thinness and thickness in a coating, and the greater security of getting the paint into ordinarily inaccessible or difficult places, the spray job will generally prove more satisfactory for maintenance purposes than brush work.

The Cleaning of the Equipment

Extreme precaution should be taken with reference to using ordinary garden hose for paint hose. Paints passing through this class of hose continuously will cause it to deteriorate in a short time. Small pieces of the rubber from the hose will cause the nozzle to become clogged, and trouble starts by having to clean out the spray every hour or so, thus losing a great deal of time. Nothing but a hose specially built for spray painting should be used. Cleaning the spray equipment after the day's work is finished is of the utmost importance. Much trouble with spray machines may come from neglect to observe this precaution. The proper way to clean the equipment is to blow all paint out of the paint line and tank, and then run ½ gal. of kerosene through the tank and the paint line. The spray-gun should be disconnected from the paint hose and left in kerosene overnight.

Electrical Pumping Proves Economical*

THE Association has felt that if definite data could be collected showing the various economies effected by electrical applications it would help materially in establishing a greater appreciation for the accomplishments in this direction.

The following paragraphs together with the table which accompanies this report, show that the economies effected by electrical applications in pumping water have been large and also, that in a number of cases better service was an important item. Believing that a detailed analysis of the typical examples furnished by the roads, showing just how the economies

Table of Electrical Pumping Installations

	Stations electrically equipped to replace gas, steam or other drive	Stations where better service was the controlling factor	Stations where decreased maint. was the controlling factor	Stations where labor saving was the controlling factor	Stations where fuel saving was the controlling factor	Stations where saving in fixed chgs. was the controlling factor	Present yearly net savings	Approximate per cent return on investment
A., T. & S. F.	...	...	...	...	1	...	.....	...
B. & O.	15	4	5	5	1	0	$1,740	58
B. & M.	35	35	35	35	35	0	.....	...
C. of G.	6	...	...	6	...	...	420	27
C. & N. W.	56	56	56	56	56	...	6,000	100
C., I. & L.	6	6	6	6	6	4	1,543	95
C. C. C. & St. L.	10	...	...	10	...	...	1,500	20
D. & H.	...	...	...	...	...	...	.....	...
E., J. & E.	5	5	5	5	5	5	.....	...
I. C.	46	46	46	46	...	...	.....	...
K. C. S.	...	...	...	...	...	...	.....	...
L. V.	...	...	...	...	...	...	.....	...
L. I.	3	...	...	3	3	3	900	36
M. C.	3	...	...	2	1	...	3,498	134
N., C. & St. L.	...	...	...	...	...	...	.....	...
N. Y., O. & W.	8	8	8	8	8	8	12,500	40
N. Y., C. & St. L.	1	...	...	1	...	...	.....	...
N. Y., N. H. & H.	22	12	0	7	0	3	11,036	284
N. & W.	1	...	...	1	1	...	6,000	35
N. P.	40	40	30	14	16	...	380	5
N. W. P.	5	5	5	5	5	...	204	64
P. and E.	3	...	...	2	...	1	400	46
P. M.	22	7	3	8	4	...	50%	...
Reading	17	...	...	...	...	...	.....	...
Rutland	3	3	3	...	...	...	.....	...
St. L.-S. F.	4	4	4	...	4	...	.....	...
S. A. & A. P.	...	...	...	...	...	...	.....	...
S. P.	...	...	...	...	...	...	.....	...
U. P.	13	13	...	...	...	...	.....	...
L. A. & S. L.	6	2	2	2	2	3	1,900	20
O. S. L.	12	...	12	12	12	1	18,000	50
O., W. R. & N.	4	4	4	1	4	...	10,000	68
Wabash	11	4	4	3	...	...	28,000	43

*From a report presented at the convention of the Association of Railway Electrical Engineers in Chicago on October 21-24, 1924.

were brought about would be of interest, the most important of those are enumerated below.

Baltimore & Ohio—Present yearly net savings, 15 stations, $1,740. Approximate return on investment, 58 per cent, chiefly by elimination of labor.

Central of Georgia—Present yearly net savings, 6 stations, $419.88. Approximate return on investment, 27.26 per cent. Steam plant replaced by electrically driven, automatically controlled centrifugal pump. Pump controlled by float switch in top of tank one mile from pump. Saving effected by releasing pumper.

Chicago & North Western—Present yearly net savings, 56 stations, $6,000. Approximate return 100 per cent. By electrical operation (automatic), savings were made in labor, fuel and switching charges and better service obtained.

Chicago, Indianapolis & Louisville—Present yearly net savings, 6 stations, $1,542.92. Approximate return 95 per cent. Elimination of pumpers, reduction of fuel, oil and shop expense, compared to current, labor of signal men and pump repairmen. All new equipment contemplated is electric.

Cleveland, Cincinnati, Chicago & St. Louis—Present yearly net savings, 10 stations, $150. Approximate return 20 per cent. Cost of operating steam plant, $6,400 per year. Cost of operating electric plant, $4,000 per year. Fixed charges on additional investment, $800 per year. Saving of $1,500 per year. Pumps automatically operated, saving pumpers' wages.

Maine Central & Portland Terminal—Present yearly net savings, 3 stations, $3,497.76. Approximate return, 134½ per cent. Labor and coal account for savings.

Long Island—Present yearly net savings, 3 stations, $900. Approximate return 36 per cent. Savings realized by reducing labor charges as well as slight reductions in fuel.

New York, Ontario & Western—Present yearly net savings, 8 stations, $12,500. Approximate return 40 per cent. Automatic control eliminating attendance is greatest factor with greatly decreased maintenance as against steam plants.

New York, New Haven & Hartford—Present yearly net savings, 22 stations, $11,036. Approximate return, 284 per cent. Savings realized by elimination of boiler plant, electric generators and labor and substitution of purchased power.

Norfolk & Western—Present yearly net savings, 1 station, $6,000. Approximate return 35 per cent. By electrical operation men necessary for handling coal, etc., were cut off and savings made in fuel necessary for steam operation.

Northwestern Pacific—Present yearly net saving, 5 stations, $204. Approximate return 63.5 per cent. Eliminated attendant at $14 per month. Gas engine replaced by automatically controlled electric motor with estimated saving of $3 per month in ehergy, maintenance and depreciation charges.

Peoria & Eastern—Present yearly net saving, 3 stations, $4,000. Approximate return, 46.28 per cent. Water company paid an average of $7,000 per year for water. By installing duplicated centrifugal pumps, electrically driven, power charge averages $3,000 per year. Saving of $4,000 per year.

Pere Marquette—22 stations. Saving of 50 per cent. Dispensing with pumpers.

Wabash—Present yearly net savings, $2,800-one installation. 11 stations. Approximate return 43 per cent. Difference in cost of coal and electric current, $780. Decreased maintenance, $100. Reduction in operating labor, $1,920.

Los Angeles & Salt Lake—Present yearly net savings, 6 stations, $1,900. Approximate return 20 per cent.

Oregon Short Line—Present yearly net savings, 12 stations, $18,000. Approximate return, 50 per cent by the saving in coal, labor, fixed charges and switching.

Finger Free Track Bolts Save Labor

By B. M. CHENEY
General Inspector Permanent Way and Structures, Chicago, Burlington & Quincy, Chicago

THE life of rail is governed to such a large extent by the efficiency of the joint that it is evident that any measures which tend to improve joints must receive careful consideration. Also as the best joint may be a failure if it is not applied with proper fittings, the bolts which hold it in place assume an importance in the track structure out of all proportion to their relative cost.

The adoption of oil-quenched bolts several years ago eliminated to a large extent the trouble we had been having due to stretch and breakage of bolts, while the use of high tension rail-joint springs has resulted in a great improvement in the maintenance of tight joints. The added expense involved in the adoption of these measures has been warranted many times over by the results obtained.

Our observations convinced us, however, that there was one other feature in connection with bolts that should be followed up carefully with a view of obtaining still greater efficiency and reduced maintenance cost, viz., the threading of the bolt and nut. Our specifications governing the threading of track bolts are practically the same as those of most railroads in that they provide for what is termed a wrench-tight fit. On our one-inch bolts, the pitch of the threads on the nut is 7 4-5 per in., while that of the bolt is 8 threads per inch. We specify that the first 2 to 6 threads shall be finger-fit so that the nut may be started easily by hand.

Labor Wasted in Wrenching Bolts

Following the finger-fit threads, the threads of the nut begin to impinge on the threads of the bolt and it is here that we expend an amount of labor that it would seem is largely if not entirely unnecessary, involving a waste that should, if possible, be eliminated.

Investigations begun by the writer in 1921 soon led to the conclusion that if bolts with finger-free nuts could be used successfully they would offer the following advantages: (1) They would insure that all labor expended in wrenching is productive of tight joints; (2) They would insure a more equal spread of the load over all of the bolts in the joint; (3) They would eliminate the waste of labor incident to the use of wrench-fit bolts; (4) They would be reclaimable up to almost 100 per cent.

Whether or not they might be practicable seemed to hinge on four questions: (1) Will they back off in service? (2) Will the threads strip? (3) Can they be manufactured? (4) Will they cost more than wrench-fit bolts?

Considering these questions in the order named: Will the Nuts Back Off? It seemed quite clear from past experience that they could not be used without nutlocks or with the ordinary coil nutlock, but it did seem quite possible that they might be used successfully in conjunction with high tension rail-joint springs, which deliver high pressure through a range of almost ⅛ in. Accordingly, in the fall of 1921 a dozen one-inch bolts on which nuts could be turned all the way with the fingers were obtained and applied to three joints in the main track. On May 1, 1922, none of the nuts had shown any backturn. We then obtained a few kegs of free-turn bolts for further test. On June 20 to 24, 1922, we applied these bolts on 198 joints equipped with railjoint springs. These joints were tightened again on July 12 and the nuts left approximately square, a punch mark being made at that time on the top of each nut. The foreman was instructed to tighten only such bolts as might become loose and to keep a record of such tightening. If he had had a steady force, these instructions might have been carried out, but the force on that section has been transient (and usually Mexican) and for many months it was difficult to keep men there at all, so we have no record showing

Total free-turn bolts originally installed	792
Number of bolts replaced account breakage	9
Number of bolts that had not been tightened and on which the nut stood as left on July 12, 1922	620
Number of bolts that had been tightened	113

just when and why certain were tightened. However, a recent inspection of these bolts after they had been in track 22 months showed the results disclosed by the table.

The foreman estimates that of the 113 bolts tightened, not over a dozen were tightened because of the nut turning backward. In most cases, they were tightened because re-action in the joint spring indicated that the joint was becoming loose. If the joints had been tightened two or three times during the first 60 days after installation, as is now our practice, it seems fair to assume that few if any bolts would have become loose.

During the spring and summer of 1923 we made five additional test installations, one mile on each district. During the first 60 days after installation the joints were tightened two to three times. After one year's service, reports are unanimous that there has been no tendency of the nut to back off, so we feel safe in the conclusion that finger-free bolts may be used with joint springs.

Will the Threads Strip? None of the 792 bolts installed in 1922 have failed on account of the stripping of threads, and none of the 6,400 installed in 1923 have failed on account of stripping. Four bolts were tested in our laboratory, being placed in the machine so that the applied load came against the face of the nut and the head of the bolt. All bolts broke in the threads below (or outside) the nut. Therefore, we need have no more fear of stripping free-turn than of wrench-fit bolts.

Can They be Manufactured? The fact that they *have* been produced for us answers the question of their manufacture. Manufacturers assure us that there will be no difficulty in making the bolts. Manufacturers have also assured us that there will be no difference in cost.

The argument that free-turn bolts afford the assurance that all of the labor expended in wrenching is productive of tight joints, is probably the strongest argument in favor of free-turn bolts. With wrench-fit bolts, a large part of the energy of the laborer may be expended in overcoming thread friction while many bolts turn so hard that after the nut comes in contact with the bar there is very little joint-tighening pressure.

Also an equal spread of the load over all the bolts in the joint is very desirable for otherwise the tightest bolt bears the brunt of the impact and is apt to stretch. Unequal load on the bolts results in uneven wear of the joint and once bars begin to wear unevenly, the joint very soon becomes ineffective.

Free turn bolts will also effect a marked saving in the labor required to apply and remove nuts. Time-studies that we have just made indicate as follows:

Average time required to remove free-turn bolts—30 seconds.

Average time required to remove wrench-fit bolts—2 minutes.

Average time required to apply free-turn bolts—1 minute.

Average time required to apply wrench-fit bolts—2¼ minutes.

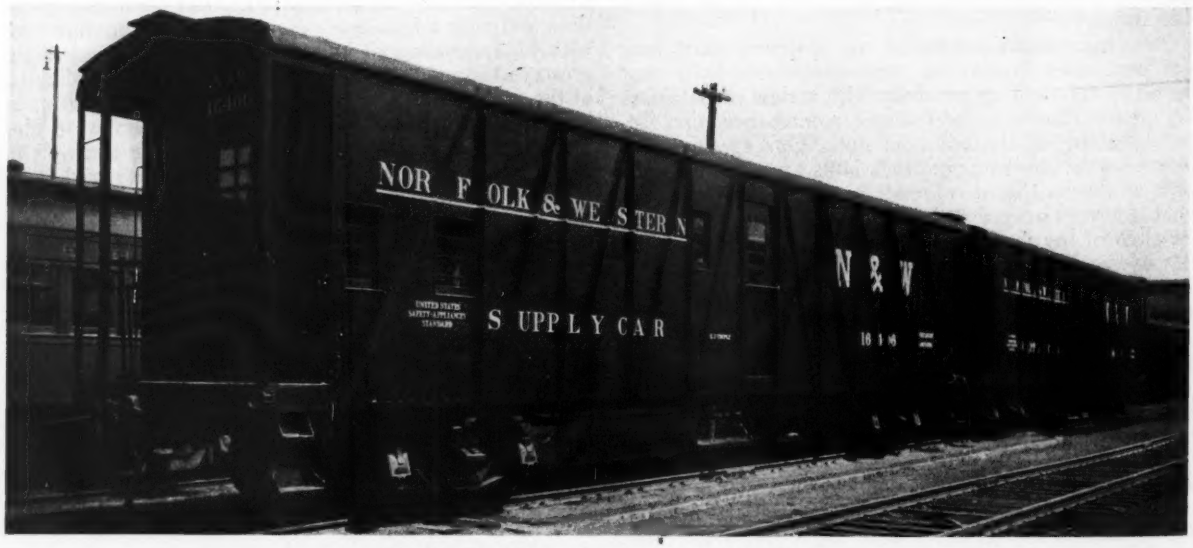
All bolts removed had been in track two years. The free-turn bolts supplied were second-hand bolts removed in connection with tests, while the wrench-fit bolts applied were new bolts from stock, without rust and well oiled. Thus it would seem that free-turn bolts will effect a saving in labor on one track mile of rail relay as follows:

Removing old bolts	33 man hours
Applying new bolts	27 " "
Total labor saved per track mile	60 " "

These figures are, of course, based on tests of bolts only two years in track. Tests made on wrench-fit bolts that have been in track 10 years indicate that the removal of nuts requires about four minutes per bolt. As free-turn bolts were removed as readily after two years' service as when they were first installed, it seems fair to assume that the saving is greater than the estimated.

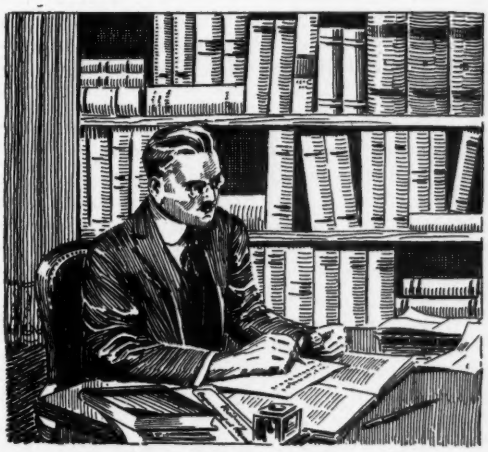
Another argument for free-turn bolts is the fact that they can be reclaimed up to almost 100 per cent. Many wrench-fit bolts are removed by cutting off the nut when it is found that the nut cannot be turned back at all, or turns with such difficulty that it is more economical to cut the nut. Recently the writer visited a reclamation dock. Several large piles of bolts ready for reclamation were noted. Practically all of the bolts were bent. Inquiry developed the fact that the nuts were cut when the bolts were removed because of the difficulty of wrenching them off. Frequently men will be seen wrenching off an old bolt at an expenditure of labor that would pay for two or three new bolts. It goes without saying that the thread of wrench-fit bolts will be damaged in service to a much greater extent than would be true of free-turn bolts.

On the strength of our tests and in view of the saving in labor and material, and the improvement in track joints that may be expected, the use of free-turn bolts with joint springs on our principal main lines has been authorized.



The New Norfolk & Western Supply Cars

What's the Answer?



This department is intended to help our readers secure answers to the questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. An endeavor will be made to answer promptly by mail, any questions received. Such questions as are of general interest will also be submitted in these columns for further discussion. *Railway Engineering and Maintenance* solicits the co-operation of its readers in answering the questions which are published.

Questions to Be Answered in the February Issue

1. *What are the relative advantages and disadvantages of the practice of arranging for all section gangs on a subdivision to engage in the same work on the same day?*

2. *Is the air lift pumping system subject to impairment by winter weather? What precautions may be taken to prevent it?*

3. *Is it desirable to number the bents of trestles and, if so, where should the numbers be placed? On creosoted structures how should they be applied?*

4. *What measures may be adopted to prevent cinders from freezing in cars while being handled to point of unloading?*

5. *Is it necessary to make provision for the expansion and contraction of concrete trestle slabs and how may this best be done?*

6. *Should track joints be loosened preparatory to oiling?*

7. *Is it practical to lay composite roofing in cold weather? What precautions should be taken to avoid cracking or subsequent trouble?*

8. *To what extent is it advisable to double up section gangs to perform heavy work when these forces are reduced to a winter basis?*

Repairing Fences in Winter

—A further answer to the following question discussed in the November issue:

To what extent is it practicable to build or repair fences during the winter?

On the New York Central lines, west of Buffalo, practically all fence building and repairing is done during the winter months by the regular section organization. There is usually no difficulty in driving steel posts because of frost. This work can be done with the regular section forces at times when the weather and track work conditions will permit without a special organization or allotment of labor, and it relieves the forces during the summer so that they can devote their entire time to essential work that can be done only in open weather. This is particularly advantageous in seasons when labor is scarce.

R. O. Rote,
Chief Engineer, New York Central, Lines West, Cleveland, Ohio

Boarding Camp Supplies

To what extent is it advisable to purchase the supplies for boarding camps and outfit cars locally?

On some roads the provisioning of boarding camps is done locally, notably the lines of the Louisville & Nashville. With a responsible provisioner and a fair allowance for purchases, this method has been found to aid in filling gangs and holding men. It also promotes good will in the communities through the practice of buying locally as far as possible. It is significant, however, that on the Louisville & Nashville some question is felt as to whether this method of provisioning cars is advisable and it is a fact that most roads handle this work from a central point except for securing such perishables as meats, dairy products, etc.

The practice of the Nashville, Chattanooga & St. Louis was described by Hunter McDonald, chief engineer, in an article published in the Railway Maintenance Engineer (now *Railway Engineering and Maintenance*), for December, 1920, which practice is still in effect. The following is abstracted from that article.

The system of purchasing supplies prior to 1907 was for each division engineer to take bids monthly for the requirements of his division and award the contract for the supplies to the lowest bidder. The costs were computed by dividing the ration bill for each gang, including the cook's pay, by the number of days' work performed by the gang during the month. Naturally, it varied according to the size of the gang and the number of days not worked, as well as with food costs and wages of cooks. A statement showing the costs of every gang on every division was made up monthly in the office of the chief engineer and sent to each division engineer in order that each might discover and remedy the leaks that were likely to develop from time to time in the system.

In 1918 the cost of boarding the men had run far beyond the amount received by the company for such board. Not wishing to raise the charge for board, a study was made in the chief engineer's office to see what economies might be effected by a system of

centralized purchasing and distribution and strict rationing. The study indicated that no increase in the charge for board would be necessary and that substantial savings would be effected at the then existing rates. The purchase of dining car and subsistence supplies was therefore assigned to the purchasing agent and a commissary agent appointed to look after it.

The ration allowance was estimated largely from the past average consumption of various articles, was checked with prevailing U. S. Army rations, and was known to be ample if proper economy and care were exercised. The division engineer prepares a summary of all supplies ordered, copies each requisition and subsistence report, and forwards three copies of each to the purchasing agent, sending a copy also to the chief engineer.

Each foreman is allowed to purchase locally dairy supplies, including fresh meat, butter, eggs and milk, equal in amount to an authorized allowance per man. These purchases are certified by the foreman and forwarded with the requisition, checked by the division engineer and the commissary agent, and vouchered by the purchasing agent. In emergency, other than dairy supplies can be purchased locally and during the summer season fresh vegetables and fruit can be purchased in lieu of potatoes, canned goods, etc., allowed on the ration list. These purchases are offset by deductions from the requisition and emergency purchases must be fully explained.

The plan above outlined of feeding maintenance of way employees has many advantages. The men are contented and the gangs are generally full. In case of wrecks or washouts, complete outfits are at hand to feed section men and other additional forces who have to be assembled quickly. The meals are furnished promptly, well cooked and served, which is not always the case where the messing system is adopted. The cost is much less to the men than they could obtain by any other method. There is no profiteering on the men, such as may often be the case where they are boarded by contractors or by the foremen. The computed cost for board includes the cook's wages. Men who are entitled to have their expenses paid while traveling are often fed at the boarding cars at a substantial saving. EDITOR.

Overcoming Dustiness and Glare on Concrete Floors

What measures can be taken to overcome dustiness and glare on concrete floors?"

First Answer

The answer to this question should properly be divided into two parts, viz.: first and most important, measures to be taken at the time of construction to prevent dustiness and glare; and second, measures to be taken after the floor is constructed to remedy these conditions.

It does not appear that a concrete floor possessing the hard, smooth surface that might be described as producing a "glare" could also be described as a floor that dusts. A smooth, polished finish is obtained by steel troweling after the surface has attained considerable stiffness. In this process, trowel marks left by the first finisher when the surface was still plastic can be obliterated and a glossy surface produced. Where it is desired to produce a very smooth, glossy surface, the finish coat is made quite rich in cement, because such a finish cannot be obtained by troweling if the surface contains coarse particles of sand. If the first troweling of such a floor is kept down to a minimum, and the amount of water used in the mix is also kept down, dusting will not result from the use of the floor.

Dusting, that is, weakness of the top surface of a floor, is due to a combination of causes, chief of which are the use of too much water in the mix, overtroweling and application of dry material to hasten the work of finishing.

The use of too much water in the mix affects the surface of a concrete floor in the same or in an exaggerated way as it does the strength of concrete. The working that a concrete floor receives will bring fine particles of sand and dirt to the surface with great ease when the concrete is sloppy. If the top surface of a concrete floor consists in any large part of laitance it will not produce a hard, wear-resisting surface when finished with a trowel. Over-troweling has the effect of bringing the lighter, finer particles to the surface. It is possible to bring up so much fine sand, dirt and water as to separate the particles of cement so that the hydrating process takes place in a medium so diluted that the strength is greatly impaired. The presence of the fine particles of dust, dirt and sand are then in a position to be stirred up by traffic and thus produce the dusting. The precautions are to keep down the amount of mixing water, reduce the troweling to a minimum, avoid using dry material to hasten the work of finishing, and keep the floor damp for ten days or two weeks. If this is done, a dense, hard, wear-resisting surface will result.

The Committee on Floor Finish of the American Concrete Institute has produced specifications for concrete floor finish, which, if followed, will effectively prevent dusting. The following is quoted in part from these specifications, and explanatory notes accompany them:

Consistency—The mortar shall be of the driest consistency possible to work with a sawing motion of the strikeboard.

(Note: The remarks on the consistency of the concrete for the slab apply with equal or added force to the wearing course, for this is the part of the floor which must withstand all the abrasive action of traffic.)

Finishing—After the wearing course has been brought to the established grade by means of a strikeboard, it shall be worked with a wood float in a manner which will thoroughly compact it and provide a surface free from depressions or irregularities of any kind. When required, the surface shall be steel-troweled, but excessive working shall be avoided. A mixture of dry cement, sand and number one aggregate may be applied to the fresh concrete of the base for a wearing course, but in no case shall dry cement or a mixture of dry cement and sand be sprinkled on the surface of the wearing course to absorb moisture or to hasten the hardening. Special methods not conflicting with these specifications may be used.

(Note: Working the surface of a concrete floor with a wood float smooths out any inequalities and compacts the surface without drawing to the top the finer particles of cement and sand. All of this adds to the value of the floor. Working with a steel trowel gives a smoother finish, but excessive troweling tends to bring fine particles in the mixture to the surface. These fine particles are not firmly cemented together and loosen rapidly under traffic, thus causing objectionable dust. The same objectionable feature results from sprinkling dry cement or a dry mixture of cement and sand on the finished surface.

In all cases as soon as the floor has hardened sufficiently, it should be protected from too rapid drying by a covering of damp sand or by flooding with water.

Reference to special methods will permit the use of the so-called "monolithic method" of finishing concrete floors in buildings, but prohibits the practice of drying up excess water on the surface of a wearing course by dusting on a drier.)

Surfaces of concrete floors, that, by reason of violation of some of the principles outlined above, exhibit the phenomenon of dusting under traffic can often be considerably improved as to wearing qualities and the dusting stopped by simple treatments. Many of the materials used in these treatments are produced by well known chemical manufacturing companies and are on the market either for sale outright, or for use by specialists who accept contracts to cure the phenomenon of dusting through the application of their material.

Following are some of the materials used to improve the wearing qualities of a concrete floor: Magnesium fluosilicate, sodium silicate, aluminum sulphate, zinc sulphate, various gums, soaps and paraffins, and combinations of these with other substances.

The magnesium fluosilicate treatment consists in a number of applications of a solution of the silicate to the floor surface. Sodium silicate in a solution with a small amount of an organic acid added, applied in two or more coats 24 hr. apart will ordinarily produce a lighter color than the original color of the floor.

A 15 per cent solution of aluminum sulphate applied liberally with a whitewash brush at intervals of 24 hours, has been found effective in curing dusting. This treatment is very economical and can be applied without material interference with traffic.

The zinc sulphate treatment consists in the application of about a 16 per cent solution of zinc sulphate with about 4½ per cent free sulphuric acid. The surface should be scrubbed with hot water and mopped dry just before the application of the second coat. This gives the floor a darker appearance than the original concrete.

The zinc sulphate treatment, of course, tends to reduce glare by producing a darker color. There are also a number of floor paints on the market that may be advantageously used to reduce objectionable reflection of light. Such paints, however, should not contain raw linseed oil, or other oil that will saponify in the presence of lime compounds unless the floor has been previously treated to neutralize these compounds.

A. C. IRWIN,
Manager Railways Bureau, Portland Cement Association, Chicago

Second Answer

(For further information on the subject attention is directed to the following comments on the repair of shop floors published in the Industrial Engineer for August, 1924.)

The wear on a concrete floor, by truck wheels, occurs in an amount depending on the preliminary treatment of the concrete. Any small crack or slight crevice causes the steel truck wheels to bump and under these circumstances ordinary concrete tends to crumble rapidly.

Floors worn to this condition are expensive to repair because resurfacing with a rich mixture of cement is possible only by removal of one to two inches of the top surface to obtain a bonding surface sufficiently clean and clear of grease to which the top coat will adhere and have body enough to withstand pounding of the truck wheels. While this method has been used in one large plant, it was found necessary, after three years, to remove the concrete in the path of the trucking for the entire depth and rebuild that section of the floor.

To prevent this rapid wear another plant has adopted a surface treatment which consists of several coats of boiled linseed oil thinned with gasoline. This mixture apparently penetrates the pores of the concrete and forms a gummy bond which resists wear, as the floor has given six years of service and still is in good condition. An additional advantage is that this floor is practically free of dusting, which is objectionable in that it is detrimental to open machinery.

Keeping Spikes Snug to Rail

What plan should be followed for keeping spikes snug to the rail at all times?

First Answer

The holding of spikes flush and snug to the base of the rail is not a seasonal but a constant requirement. There is no other method but a conscientious detailed maintenance.

Spikes work above the base of rail or from the base from two causes, namely, the weaving movement of the rail under train loads and the nosing or thrust of the wheels against the gage side of the rail. A live foreman will be keen to observe these conditions and work out a program to offset them because poor ties, dirty ballast, loose bolts, all contribute to produce this lifting and shoving. One condition impinges on the other and runs throughout the whole fabric of track maintenance. The track walker should keep the spikes driven down and should do as much gaging during the winter as conditions will permit. The remedy is to pull spikes, plug the holes and redrive. When the spikes will not hold the fibre of the tie has outlived its usefulness and should be replaced.

A. E. PREBLE,
Supervisor, Pennsylvania, Middletown, Pa.

Second Answer

The chief cause of spikes working loose is the vibration of the track resulting when the ties are not thoroughly tamped under the rail. Each section gang should start at one end of its section and tamp up all loose ties and spot where necessary. All spikes that are loose should be drawn out, a good tie plug that has just been dipped in a bucket of creosote carried for that purpose inserted, and the spike redriven. When the other end of the section is reached and all spikes have been handled in this manner and all ties tamped, I do not see any reason why a trackwalker could not take a mile or so of track each day and keep the spikes down. I have noticed on this division that spikes do not come up as badly in the winter months as they do in the summer months, which it appears is caused by the absence of rain in the summer as compared with the moisture of the winter season. F. M. KNIGHT,
Extra Gang Foreman, Southern Pacific, Merced, Calif.

Third Answer

No particular method has been followed on the New York, Ontario & Western of keeping spikes driven down. The trackwalkers tap some down and if the condition becomes particularly bad the whole gang is assigned to the work.

I have observed that where ties are fairly sound and a properly designed spike is used less difficulty is experienced than where a small spike carelessly driven is used. It appears that the horizontal movement in the rail toward the ends of the ties is probably one of the chief causes of spikes working up. Where the tie plates and spikes fit close to the rail, comparatively little trouble is experienced.

For the past 10 years we have used a tie plate canted 1 in 20, with a small amount of camber in the plate. Two holes are punched on the inside and one on the outside where the shoulder is. These holes are punched so that the spikes fit snug to the base of the

rail. We seem to have less difficulty keeping spikes down with this method of punching them where spikes do not fit snug. It might be well to explain further that our rail is laid in the summer and the ties spaced and the track resurfaced. This might make some difference because there seems to be a tendency for frozen wood to split, which would let the spike work loose. F. J. MEYER,

Assistant Engineer, New York, Ontario & Western, Middletown, N. Y.

Fourth Answer

I do not think there is any method or plan that will keep spikes snug to the rail in wood ties. If the ties are sound they can be kept within ⅛ in. to ¼ in. by tapping them down once a year. If the ties are bad they can not be kept down without frequent driving. If there was any way to keep the spikes snug to the rail the heads would become broken when the tie is frozen in the roadbed, for the rail would not have sufficient give. GEORGE MILLER,

Section Foreman, Chicago, Burlington & Quincy, Romford, S. D.

The Allowable Staggering of Joints

What is the maximum permissible variation from the standard spacing of joints and centers on tangent track? On curves?

First Answer

It has been the practice on the Illinois Central for the past ten years not to slot spike joints, and in laying rail no effort is made to have suspending or supported joints, but instead the joints are allowed to occur where they will relative to the tie. Therefore, so far as joints are concerned, this makes it unnecessary to space them. This practice, furthermore, permits a uniform spacing of ties through the entire length of the rail. Even with this practice, however, it is considered advisable not to permit a variation in excess of six inches in placing joints relative to the center of the opposite rail. It is felt that by adhering to this practice a more uniformly good riding track can be obtained than would result with a greater variation. The practice is the same on tangents and curves. A. F. BLAESS,

Engineer Maintenance of Way, Illinois Central, Chicago

Second Answer

It is the practice on the St. Louis-San Francisco to lay all rail so that the joints will fall not more than 12 in. from the center of the opposite rail. This is the rule on both tangent and curved track.

F. G. JONAH,

Chief Engineer, St. Louis-San Francisco, St. Louis Mo.

Pre-Cutting Lumber for Railway Buildings

To what extent is it practical to pre-cut at a central point the lumber required for small standard railway buildings?

First Answer

In my judgment it is not practical to pre-cut at a central point the lumber required for small standard railway structures to be constructed at outlying points.

H. A. HORNING,

Superintendent of Buildings, Michigan Central, Jackson, Mich.

Second Answer

It is practical to pre-cut lumber for railway buildings at a central point. In France, the American Army had engineer dumps or depots where bridge and building materials of standard size were stored. It was the writer's experience that this was a very efficient method, especially from a labor and time saving viewpoint.

The same idea could be carried out with railroads having standard buildings. By having materials cut to standard sizes at a central point, a certain amount of waste would be eliminated and time saved, which means a saving of money, a very important factor in construction and maintenance work. Rafters, joists, studs, framing materials, etc., could be cut to specified sizes, stored and sent, on requisition, to the location for erection or assembly. Precautions must be taken against carrying too large a stock. The amount could be determined from the proposed construction program or from an average of the buildings erected during a certain number of years. EARL W. MCKEE,

Draftsman, Bessemer & Lake Erie, Greenville, Pa.

Third Answer

Railroads which adhere strictly to their standard plans for the smaller frame buildings and which use the yearly budget system for building construction, should find it both economical and expedient to pre-cut lumber at central points for the following small types of buildings:

Pagodas and the smaller frame stations.
Section houses.
Signal houses.
Tool houses.
Watchmen's shanties.
Pump houses.
Hand car houses.
Scale houses.
Coal houses.

However, my experience is that even where the budget method is used, there is often danger in relying on this program to the extent of pre-cutting lumber at centrally located points, as it often happens that conditions arise which change the supposedly fixed program materially. This may bring about an excessive haul of material or cause an excessive stock of lumber to be carried on hand, the interest on the cost of which would more than off-set the saving expected by pre-cutting of lumber at central points.

FRANK R. JUDD,

Engineer of Buildings, Illinois Central, Chicago.

Opening Track Ditches in Winter

Does the likelihood of sudden thaws during the winter warrant opening track ditches whenever snow is plowed from the track?

First Answer

The opening of track ditches when snow is plowed from the track is only necessary in March and April to take care of the additional amount of water formed by melting snow. It is always dangerous to open ditches in the heart of the winter for any cause except where the water would overflow the track, as the snow in the ditches is necessary to check the frost from freezing the bottom of the ditch.

Cleaning the ditch in the heart of winter may also mean that the water reaching the ditch will freeze continuously, filling the ditch with solid ice and from then on the track which will require daily supervision at additional expense. OSCAR SURPRENANT,

Roadmaster, Delaware & Hudson, Schenectady, N. Y.

Second Answer

In our territory from Lake Michigan to Montana, the opening of track ditches or trenching snow in winter time as precaution against sudden thaws is not only unnecessary but at times is detrimental. In practice, any openings made on or below the surface

are kept filled up by frequent flanging and dozing of the snow from the track which is commonly done, especially flanging, many times daily. With the snow drifting, it would be most difficult to maintain openings even though they were required.

When track ditches that have more or less snow in them are kept trenched, it results in exposing the ditches to freezing and causes an accumulation that will finally displace the snow with an equivalent in ice, while, if the ditch is left protected by the snow covering, it will be found ordinarily that the water will tunnel its way beneath the snow and effect a natural outlet.

However, during thaws of consequence, especially in the spring, the work of trenching in snow, opening of ditches, culverts, etc., should receive special attention as at this time drainage is necessary and anything accomplished in the way of providing it will result in better maintenance and greater safety.

J. B. KELLY,
Assistant General Roadmaster, Minneapolis, St. Paul & Sault Ste. Marie, Minneapolis, Minn.

Third Answer

I have always made ditches through cuts filled with snow and through drifts that interfered with the flow of water. The work should not wait for thaws but should be done as soon as possible after a storm has ceased.

D. FOLEY,
Inspector Maintenance of Way, Michigan Central, Jackson, Mich.

Fourth Answer

In the northeastern portion of Canada the winter season is long and severe. Thaws such as occur during the early and mid portions of the season, do not warrant the opening of the track ditches when the snow has been plowed from the track. Toward the end of the winter such precautionary measures are not only warranted but even necessitated on account of the uncertainty of the climatic reaction.

The early and mid portions of the winter are marked by heavy snowfalls and blustery gales, occasionally modified by a mild spell. If we, in this latitude, were to open up all track ditches in anticipation of these sudden thaws, we would not only incur an enormous expense on account of the labor required but would promote a condition which would give rise to rough track due to the frost working deeper at these points. The ground is ordinarily covered with from four to six feet of snow and if the ditches were cleaned out after plowing, any water accumulating during the day, would not get a quick run off owing to the adjoining ditches being full of snow and would freeze in the ditches during the night. The ice thus formed would gradually accumulate until the ditches would be filled.

If proper measures are taken in the fall to see that all the culverts, ditches and waterways are thoroughly cleaned, that the bottom of the ditches are maintained to an even grade, thus preventing water pockets, that the material removed when cleaning these drains is properly leveled back and not thrown on the immediate face of the drain where it will be washed back by rains, any water which may arise from these thaws will find its way to the drain bed and thus protected by the heavy blanket of snow above, will gradually work its way to its proper outlet.

In the middle of March, when the severity of the weather conditions has relaxed, it is then necessary to open all the inlets and outlets of the culverts and waterways and everything should be removed which would impede the flow of the water, whether it be ice or other foreign material.

After each storm it is essential that the water arising either through the melting of the snow or through rainfalls, is removed from the roadbed as quickly as possible and this can only be accomplished by keeping the drains open and thwarting any condition which would lead to the weakening of the roadbed, either through its being flooded or possibly washed out.

F. LISTON,
Canadian Pacific, Vaudreuil Station, Quebec

Spotting in Tie Plates

—A further answer to the following question which was discussed in the November issue:

When installing tie plates, is it good practice to spot them in as ties are renewed or should they be inserted out of face?

Where ties are being "spotted in" tie plates should be applied only on the new ties inserted to avoid disturbing the general surface of the track. During out-of-face surfacing, all ties not plated should receive new plates after being carefully adzed and prepared for them.

It is not good practice to insert tie plates out of face during the work of "spotting in ties" because of the uneven bearing created. On the other hand the opportunity to apply plates on all ties during general work should not be passed because in doing so additional life is secured from the ties so plated at that time.

G. M. O'ROURKE,
Roadmaster, Illinois Central, Carbondale, Ill.

Thawing Pipe Lines With Electricity

Under what conditions can electricity be used to thaw out water lines? How is it done?

First Answer

Electricity is the ideal medium for thawing out frozen water lines under practically any condition. Lead and iron pipes are both relatively poor conductors of electricity and, therefore, if a heavy electric current is passed through either lead or iron piping, the resistance offered by these metals to the flow of the current will change the electric energy into heat. This heat is generated nearly uniformly along the entire length of pipe through which the current flows. The possibility of so heating a long section of pipe uniformly makes the electrical method of thawing frozen pipes highly effective.

For thawing out ordinary service pipes, it has been found that a current of 150 to 300 amp., at 55 to 110 volts, applied for 5 to 15 min., will usually be sufficient. The time, of course, depends upon the length of the frozen section and upon the degree to which the pipes are frozen. No general information can be given as to the time it will take to thaw out different lengths of pipe, as values will vary greatly, depending upon the size and length of pipe, its location above or under ground, the condition of soil, etc.

The following table gives some results which have been obtained by the electrical method:

Size of Pipe Iron, In.	Length Feet	Amperes	Volts	Time
¾	100	135	55	10 min.
1	700	175	55	5 hr.
2	50	500	55	2 hr.
4	800	300	55	3 hr.
6	400	800	110	2¼ hr.

For railway work, a very simple set could be constructed for operating off a 2300-volt alternating current circuit, consisting of two 10 or 15 kv-a, 2300-volt

distribution transformers connected to give 55 or 110 volts secondary at no load. In the first case, the primaries are connected in series and the secondaries in parallel, while in the second case, both primaries and secondaries are in parallel. Beside the two standard distribution transformers, all that is needed is two cut-outs and fuses for the primary and one primary ammeter. No regulating apparatus is necessary, as variation in current may be had by changing the connection and by looping the secondary cable. This set could be mounted easily on a flat car and moved from place to place, as desired.

If 2300-volt alternating current lines are not available, 440, 550 or 600-volt alternating current transformers can be used in place of the 2300-volt ones. A number of central stations have used this outfit for thawing out water pipes in residences with great success.

The General Electric Company manufactures and markets a small portable transformer for thawing out small pipes. This outfit weighs but 35 lbs. and can be connected to the 110-volt alternating current house lighting circuit. It is known as the G-E Wayne Pipe Thawer. This has proved successful in thawing out small pipes up to and including one inch in diameter. It cannot, however, be used for thawing out pipes under ground. G. S. Miller,

Transformer Department, General Electric Company, Pittsfield, Mass.

Second Answer

Electricity is used extensively for thawing out pipe lines by many of the larger cities. Current for this purpose is generated by a portable outfit, usually consisting of a gasoline engine and generator mounted on a truck for use at isolated points where electric current is not available. Where it is possible to secure current from a central station supply it is generally cheaper and better to use this source of energy.

Equipment used in connection with current taken direct from a central station supply is also carried on a truck, a typical outfit consisting of transformer, a barrel of water with two electrodes for a rheostat, and about 1,000 ft. of heavy copper wire. The current from the high tension wires is stepped down through the transformer to low voltage but high amperage. A number of manufacturers of electrical equipment are now building transformers especially designed for this work known as pipe thawing transformers which are comparatively simple to operate. Also complete pipe thawing outfits consisting of power unit, generator, etc., mounted on a truck are being manufactured.

Many of the electric light and power service companies now maintain suitable equipment for electric thawing. In some cases the water companies have agreement with these public service companies to handle the work for them. While the use of electric pipe thawing equipment is not particularly dangerous, except where current is taken from high tension wires, there is a certain hazard when the work is attempted by men inexperienced in this class of work. It is, therefore, advisable before attempting work of this kind to have an experienced electrician in charge of the work, at least until such a time as the employees become familiar with the proper handling of the apparatus.

Electrical thawing equipment has been used chiefly for thawing small service pipes but can also be used on large lines. One of the most notable instances of pipe thawing is that carried out on a 6-in. line about 1700 ft. long, extending from 140th St., New York City, to North Brothers Island. This line was laid in salt water at a maximum depth of 80 ft. below the surface. It was frozen in February, 1912. Temperatures taken of the water showed a surface temperature of 32 deg. and 29 deg. at a depth of 50 ft. Also temperatures taken later showed 29 deg. at 15 ft. below the surface. The line was thawed out by installing four 100 kw. transformers, stepping the high tension current down from 2,000 volts to 200 volts. The current used ranged from 800 amperes at 200 volts to 1800 amperes at 368 volts. The time required to thaw out this pipe was a little more than five days. It required 1000 hp. to thaw this line, which was 36 times the amount of heat necessary to melt the same quantity of ice on hand. C. R. Knowles,

Superintendent Water Service, Illinois Central, Chicago

For further information the reader is referred to Bulletin No. 7 of the Engineering Extension Service of Purdue University, Lafayette, Ind., which contains a comprehensive treatise on the subject, with illustrations, by D. D. Ewing, professor of electrical railway engineering, and C. F. Bowman, assistant in electrical engineering.

Winter Inspection of Insulated Joints

Does the frequency of rail breaking at insulated joints justify their removal for inspection on the approach of winter?

First Answer

We have not found that there are sufficient breakages of rails in insulated joints to justify their removal for inspection on the approach of winter.

R. V. Reamer,

Engineer Maintenance of Way, Central Railroad of New Jersey, Jersey City, N. J.

Second Answer

We do not have broken rails in insulated joints, therefore we do not find it necessary to remove the joints for the inspection of the rail. G. L. Moore,

Engineer Maintenance of Way, Lehigh Valley, Bethlehem, Pa.

Third Answer

We feel that it pays well to remove insulated joints twice each year for inspection. One or two instances will be cited to indicate the reason for this opinion.

During 1913, while on a main line subdivision the practice was started locally of removing every main track insulated joint for inspection of the rail within the joints excepting those in switch leads and crossovers for slow speed movements. At this time the rail section in such tracks was 100 lb. The results made us very glad we had gone to this expense and trouble, and the foremen, astonished by the number of rails removed as a result of the inspection did not raise one word of objection to the practice.

The record for the year, October, 1923, to October, 1924, of one supervisor's subdivision discloses that of 179 rail failures, 17 were in insulated joints and all of these 17 were found and removed before trouble was caused. The semi-annual inspection with the removal of splice parts was responsible for discovering the entire 17 cases before incipient cracks had reached the point of danger. On this subdivision checked there are 1,137 insulated joints. The rail in the 17 joints which failed was all of the 100-lb. section.

The estimated cost of removing joints for inspection, including the time of signalman and trackwalkers moving from point to point in the territory, averages about $1.15 per joint. J. B. Baker,

Engineer Maintenance of Way, Pennsylvania System, Harrisburgh, Pa.

New and Improved Devices

A New Anti-Creeper

THE continuing belief in the practicability and value of a spring to keep rails from creeping has its most recent demonstration in the development of a new device for this purpose called the Unit anti-creeper. As the name implies there is but one piece to this device, which consists essentially of a high-carbon, oil-treated steel

The Anti-Creeper Is Easily Applied

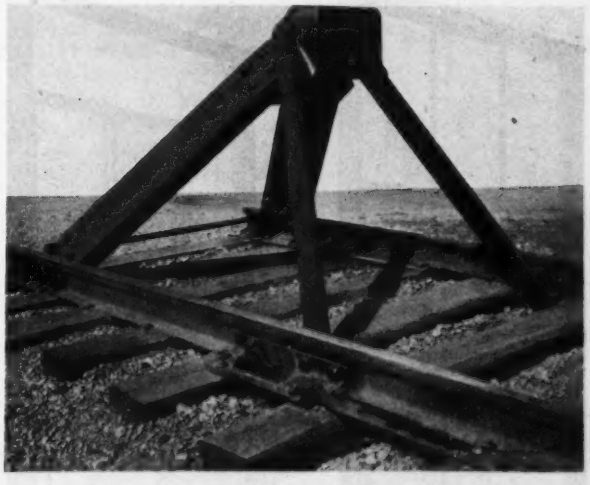
weighing 2 lb. and 2 oz. which is so shaped as to provide a hook at one end for engaging the base of the rail, while the remainder of the bar extends below the base of the rail to engage the face of the tie for bearing purposes and also to give spring in the device to hold it on the rail after the clamping is completed.

The device is applied to the rail by a special wrench having one dog which fits against the end of the clamp above the base of the rail in such a way that when force is applied to the wrench the lower dog exerts an upward pressure against the yoke below the rail sufficient to force the opposite end of the creeper upward and outward until the notch provided on the inside face snaps in place over the edge of the rail base. The application of the anti-creeper requires about 7,000 lb. pressure, which is accomplished by the application of ordinary pressure on the special wrench, which has a 5½ ft. handle for the purpose. To remove the anti-creeper, the wrench is applied from the other side.

It is claimed for this device that no hammering or other force than that exerted by the wrench is required to apply or to remove it. It is also claimed that no accidents can result in its application or removal and furthermore that the design of the device is such that it can only be applied in a proper manner. While the bar is narrow in sections, sufficient bearing space is said to be provided to eliminate any bruising or cutting of the ties, and according to the records of the Pittsburgh Testing Laboratory, a pressure of 10,000 lb. must be applied sideways against the clamp before there is any tendency towards slipping. The anchor is made in various sizes for different sections of rail. It is manufactured by the Creepcheck Company, Inc., Hoboken, N. J.

A New Bumping Post

THE Hayes Track Appliance Company, Richmond, Ind., has begun the manufacture of a bumping post which employs a method of anchoring that is unique in equipment of this character. The distinctive feature of this post is based on the theory that for best results it should be connected with the ties rather than with the rails of the track, owing to the movable condition of the latter. To accomplish this, the tension and compression joints have vertical flanges which bear against the sides of the ties. Tie anchor bars are also provided with which to distribute the thrust or tension on these joints to additional ties. The



An Installation of the Hayes Bumping Post.

result of the arrangement is to transmit the shock to eight cross ties and through them to the ballast and the earth.

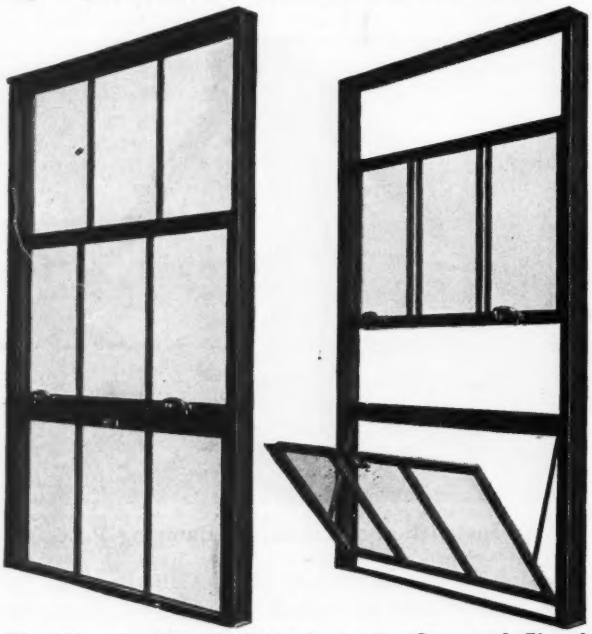
The illustration does not show the vertical flanges on these joints which, obviously, are situated directly below the rail base, but a view is afforded of the manner by which the connection between the posts and joints is made. The tension members are steel bars of rectangular section, which, instead of being bolted directly to the rail, are bent U-shaped so as to pass under the rail and up through the joint on the outside of the rail where a large pin passes through the end to hold it snugly against the joint seat. Anchoring to the adjacent tie is accomplished by fitting

the curved end of the anchor bar over a lug in the tension joint and thereupon spiking or bolting the bar to the ties outside the rail. The compression joint consists of a large casting having a square face for the compression member of the bumping post, and is provided with lugs for bolting to the rail as well as spiking to the ties. The two compression joints are connected together by a tie rod to prevent them from spreading, and similarly to the tension joints, are connected with anchor bars, except that in this case the anchor bars extend along the inside of the rail.

The compression members are steel channels with square ends which rest against the seats in the head and in the compression joints at the rails. They are bolted at each end but the bolts do not carry the compression. The tension members are not only curved at the lower ends as described, but also at the upper ends in order to go completely through the head. A large pin below the bumping head holds the tension members in place. All castings are of steel or of malleable iron, to provide the maximum resistance to shock, and the parts are formed to transmit the shock effectively. One size of post will fit any rail from 56 lb. to 130 lb., a feature which is of value in simplifying stock keeping.

A New Window for Office Buildings

THE NEW 10-story general office building which is undergoing construction by the Southern at Birmingham, Ala., is being fitted with windows which constitute a departure from the type ordinarily found in buildings of this character. It was the desire in planning the building to provide a fireproof window construction but at the same time to avoid the necessity of using the pivotal type of sash such as is found in present-day factory construction, owing to the unfavorable appearance which a downtown office building would have when the pivotal sections were opened. This led to the development of a steel sash which is divided into three horizontal sections, as shown in the illustration.



The Way the New Sash Looks in the Open and Closed Positions.

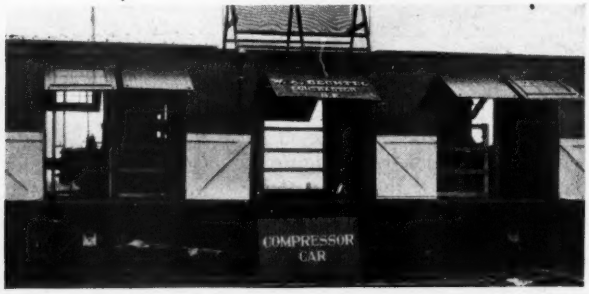
The two upper sections of the sash constitute the window proper and are counterbalanced with each other so that when the lower section of the two is raised the top section drops down an equal distance, thus affording top and bottom ventilation with a minimum of effort. The lower section of the sash is much shallower than the upper section, being only about 18 in. high, and is hinged at the lower edge so as to open inwardly, thereby furnishing ventilation when it is desired to keep the other sections of the window closed.

The sill of the window is approximately at the height of the desk but with the hinged sash at the bottom, which deflects any incoming air upward, the occupants of the building can secure ventilation without any annoyance from a direct draft or the necessity of attaching special ventilators. The arrangement is also such as to permit of opening the upper windows during reasonably drafty weather, since the opening of this portion of the sash is well above desks, and the further advantage is gained of avoiding at all times any unsightliness of the building by reason of having sections of the windows tilting outward from the building. Aside from being fireproof, it is also said that the construction allows about 30 to 40 per cent more daylight than wood windows with the same size openings.

This sash has been manufactured for the Southern by the Truscon Steel Company, Youngstown, Ohio, and is being erected, together with other portions of the building, under the supervision of J. B. Munson, vice-president of the Southern, at Cincinnati, Ohio.

Mounting an Air Compressor in a Car

A NOVEL USE of air compressor equipment has recently been developed in the form of a compressor car improvised by a contractor for use on railroad construction in the west. The outfit consists of a 100,000-lb. capacity box car in which are mounted two Ingersoll-Rand type POV-2 air compressor units, together with a 7 kw. General Electric generator for lighting purposes.

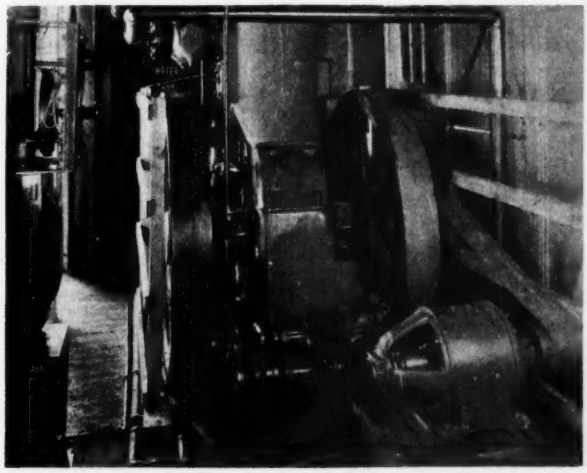


The Compressor Car Ready for Use

Each compressor is connected directly to and mounted on a 50 hp. Ingersoll-Rand oil engine of a single cylinder horizontal type operated on a four stroke cycle. The fuel oil for the engine is injected directly and is ignited by the heat of compression, there being no hot bulbs, plates or other forms of mechanical or electrical ignition. The air compressor is of the two stage construction with a water intercooler for cooling the air between stages of compression. Each compressor has a piston displacement of 271 cu. ft. of air per minute. The electric generator is belt driven from either of the oil engines and develops sufficient electricity to light the work camp and tunnel involved in the project for which the car was improvised.

A unique feature of the car is the method of cooling the circulation water used in the water jackets of the oil engine-compressor unit. In one corner of the car is a

water tank which holds the normal supply. A small air-driven water pump forces the water through the engine and compressor intercooler to a cooling tower which is mounted on the roof of the car. This water cooling tower is of A-shaped design, having on each side a heavy wire screen. The hot water is discharged on the top of the screen by means of a distributing pipe which runs the full length of the tower. As the water runs down over the screens it is cooled and collected in a basin which has been built in the roof of the car. From this basin the water runs by gravity to the main tank. This cooling tower arrangement is portable and can be set up



Looking Toward One End of the Car with One Compressor Unit and the Electric Generator in the Foreground

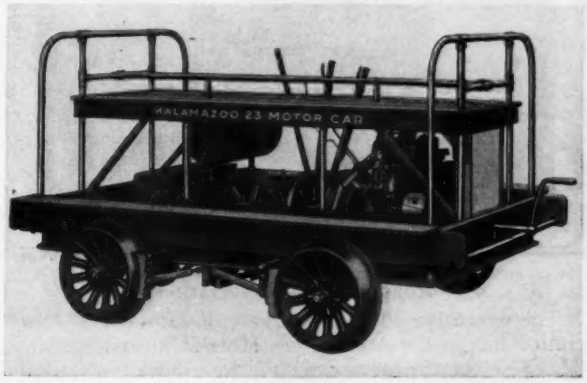
or removed in 15 min. by two men, when it is desired to arrange the car for transportation.

The plant was first placed in operation on the Southern Pacific at Oak Ridge, Ore., where its normal fuel consumption with both units operating eight hours a day was found to be approximately 50 gal. of Diesel oil, which was considered a sufficiently low cost of producing compressed air to justify the efforts made in the design and construction of the car. The owner of the car is W. A. Bethell, railroad contractor, San Francisco, Calif.

A New Kalamazoo Motor Car

THE KALAMAZOO Railway Supply Company, Kalamazoo, Mich., has begun the manufacture of a motor car for heavy section, bridge and building and inspection forces which embodies a number of new features. Principal among the new features of this car, which is designed to carry 8 to 10 men, is the balancing of the total weight of 1,200 lbs. so that two men can easily remove it from the track under practically all conditions. Recent improvements in automotive engineering have also been incorporated in the power unit.

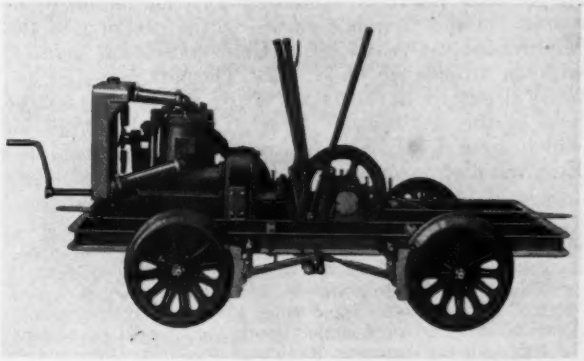
In its finished form the car, which is called the Kalamazoo No. 23 motor car, is equipped with an engine of exactly the same design as is furnished on the No. 25 extra gang and hump car, except that the engine has two cylinders instead of four, while at the same time all working parts are interchangeable with the No. 25 engine. The latter feature is of value in facilitating repairs on both cars. The motor is of the two-cylinder, vertical, four-cycle water-cooled type with 3⅛-in. bore and 4½-in. stroke and with large valves which are easily adjusted. All working parts are enclosed and all bearings and pistons lubricated by splash from a constant level oil pan filled by an oil pump which forces the oil from the reservoir in the crank case to the oil pan. The cylinder heads are removable for easy cleaning of the carbon and for grinding the valves. The transmission is of the friction



The New Kalamazoo No. 23 Motor Car Ready for Use

type, running on hardened and ground roller bearings. Double Timken bearings take all thrust of the friction surfaces and relieve the engine bearings of these loads. The friction wheel is carried on a double splined shaft which is held rigidly in alinement with the driving disc. The rear axle is driven through a hardened sprocket and an alloy steel roller chain, the links of which are detachable. Both axles run in roller bearings and in races which take the thrust of the wheel flanges in order to eliminate wear on the wheel hubs as well as any side play. This construction also lessens the friction on curves and on irregular track. The front axle is 1½ in. in diameter and the rear axle 1 11/16 in. in diameter.

In addition to providing that balancing of the truck which permits its removal from the track by two men, a large space has been provided for tools, which are held from dislodgment by raising the sides and ends of the car, and particular care has been devoted to pro-



A View of the Car with the Seat Detached Showing the New Motor and Type of Transmission

ducing a low center of gravity in order to make the car safe at all speeds. The chassis is built of standard steel channel and angle iron, riveted at the joints. Reinforced pressed steel wheels 16 in. in dia. with taper fit are used throughout except for the loose wheel which has a straight fit.

A number of these cars which are now in service are said to have demonstrated fully the claim that the cars are capable of continuous service throughout the day without overheating the motor.

With the Associations

Roadmasters' Association

The executive committee of the Roadmasters' Association met at the Auditorium Hotel, Chicago, on Nov. 22, to select the personnel of the committees to investigate and report upon the subjects selected for discussion at the next annual convention. A joint committee of members of the Roadmasters' and Track Supply Associations was also appointed to visit Kansas City in the near future to make arrangements for the convention next September.

American Wood-Preservers' Association

The report of the committee on Wood Preservation is the first to be completed and delivered to the secretary this year. Other reports are now in the final stages of preparation and most of them are expected to be received during December. Among the more elaborate reports which are being completed is that of the special committee on Stresses in Track, whose report will include the results of its investigation of the effect of the canting of rail and of unsymmetrical tie plates on straight and curved track; lateral and vertical stresses on curved track and in heavy rail.

Maintenance of Way Club of Chicago

The handling of snow and ice in terminals was the subject of a paper presented by J. J. Desmond, roadmaster on the Illinois Central, at the meeting of the Maintenance of Way Club of Chicago held on Nov. 11, with an attendance of 72. Mr. Desmond's paper appears elsewhere in this issue. The next meeting will be held at the Auditorium Hotel, Chicago, Dec. 10, at which time I. H. Schram, regional engineer of the Erie, will discuss various problems of organization.

Directory of Associations

American Railway Bridge and Building Association.—C. A. Lichty, secretary, 319 North Waller Ave., Chicago. Next convention, Buffalo, N. Y., October 20-22, 1925. Exhibit by Bridge and Building Supply Men's Association, B. J. Wilson, secretary, 605 Fisher Bldg., Chicago.

American Railway Engineering Association (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn St., Chicago. Annual convention, Congress Hotel, Chicago, March 10-12, 1925. Exhibit by National Railway Appliances Association, C. W. Kelly, secretary, Seeberger Bldg., 845 South Wabash Ave., Chicago. Exhibit at Coliseum, Chicago, March 9-12.

American Wood Preservers' Association.—P. R. Hicks, secretary, Room 1146 Otis Bldg., Chicago. Next convention February 3-5, 1925, Chicago.

National Association of Railroad Tie Producers.—J. S. Penney, secretary, T. J. Moss Tie Company, St. Louis, Mo. Next convention February 5-6, 1925, Chicago.

Roadmasters' and Maintenance of Way Association.—T. F. Donahoe, secretary, B. & O., Pittsburgh, Pa. Next convention September 15-17, 1925, Kansas City, Mo. Exhibit by Track Supply Association, W. C. Kidd, secretary, Ramapo-Ajax Corp., Hillburn, N. Y.

The Material Market

WHILE THE results of the recent election have had a profound effect on the prices of stocks and bonds they cannot be said to have exerted exactly the same influence on the market for commodities. Without question the election did serve to stimulate the material market and gave rise to announcements by manufacturers that prices could be expected to advance, but the upward tendency of prices was somewhat delayed. Particularly in the steel market it has been observed that whereas a large number of manufacturers named higher prices almost at once, little business was done at the advanced quotations until toward the close of the month. The general demand for materials continues good, calling for some increase in production, which is now estimated at about 65 per cent of capacity.

In the table below, which covers iron and steel items relating to tracks and structures, it will be seen that moderate advances have taken place during the past month.

PRICES PER 100 POUNDS

	October				November			
	Pittsburgh		Chicago		Pittsburgh		Chicago	
Track spikes	$2.70 to	$3.00	$	$2.80	$2.80 to	$3.00	$	$2.90
Track bolts	3.75 to	4.00	.....	3.80	3.75 to	4.00	.....	3.90
Angle bars	.....	2.75	.....	2.75	.....	2.75	.....	2.75
Tie plates, steel	2.40 to	2.50	.....	2.30	2.40 to	2.50	.....	2.35
Boat spikes	.....	3.00	.....	3.00	.....	3.00	.....	3.00
Plain wire	.....	2.50	.....	2.60	.....	2.50	.....	2.60
Wire nails	.....	2.75	.....	2.85	.....	2.75	2.80 to	2.85
Barb wire, galv.	.....	3.45	.....	3.55	.....	3.45	.....	3.55
C. I. pipe, 6 in. to 12 in., ton	.....	.....	.....	50.20	.....	.....	.....	50.20
Plates	1.80 to	1.90	2.00 to	2.10	1.80 to	1.90	.....	2.10
Shapes	1.90 to	2.00	2.00 to	2.10	1.90 to	2.10	.....	2.10
Bars, soft steel	2.00 to	2.10	2.00 to	2.10	2.00 to	2.10	2.00 to	2.10
Rivets, struct.	.....	2.60	.....	2.75	.....	2.60	.....	.....
Open hearth rails, per gross ton, f. o. b. mills								$43.00

Increased demand, together with the necessary increase in production, have in turn led to an increased interest on the part of the manufacturers in scrap purchases, as a result of which scrap prices are moderately higher than they were a month ago. The scrap market is considerably more active than it has been for some time.

PRICES PER GROSS TON AT CHICAGO

	October	November
Relaying rails	$27.00 to $32.00	$27.00 to $32.00
Rails for rerolling	17.00 to 17.50	18.00 to 18.50
Rails less than 3 ft. long	17.50 to 18.00	19.00 to 19.50
Frogs and switches cut apart	16.00 to 16.50	17.50 to 18.50
Steel angle bars	17.00 to 17.50	18.50 to 19.00

The lumber market manifests little change. Prices are generally the same or slightly higher than they were a month ago.

SOUTHERN PINE MILL PRICES

	October	November
Flooring, 1x4, B and B flat	$41.10	$42.20
Boards, 1x8, No. 1	34.05	32.35
Dimension, 2x4, 16, No. 1, common	25.90	26.80
Dimension, 2x10, 16, No. 1, common	27.40	27.50
Timbers, 4x4 to 8x8, No. 1	27.95	26.50
Timbers, 3x12 to 12x12, rough	32.35	34.35

DOUGLAS FIR MILL PRICES

	October	November
Flooring, 1x4, No. 2, clear flat	$24.00	$24.00
Boards, 1x8, 6 to 20, No. 1, common	17.50	17.50
Dimension, 2x4, 16, No. 1, common	18.50	18.50
Dimension, 2x10, 16, No. 1, common	18.00	18.00
Timbers, 6x6 to 8x8, No. 1, common	23.00	23.00
Timbers, 10x10 to 12x12, rough	18.00	18.00

The market for ties continues dull. There is little demand and production is limited, owing to the demand for labor in producing areas.

No changes have taken place recently in the prices of Portland cement. The following table of prices per barrel in carload lots, not including package, indicates but one change from those quoted previously.

New York	$2.15	Minneapolis	$2.42
Pittsburgh	2.19	Kansas City	2.42
New Orleans	2.80	Dallas	2.05
Chicago	2.20	Denver	2.84
Cincinnati	2.47	San Francisco	2.61

News of the Month

The Pullman Company will award 20 annual scholarships of $250 each to deserving students of agricultural colleges at the International Livestock Exposition to be held in Chicago.

The Northern Pacific has compiled figures showing that 144,158 people visited Yellowstone National park in 1924. Among the visitors arriving by railroad were 5,892 from Illinois; 3,783 from New York; 3,115 from Ohio and 2,909 from Pennsylvania.

The City Council of Chicago passed a resolution on November 12, calling for a meeting of representatives of the leading organizations in the city and other influential persons for the purpose of discussing the desirability of launching a railway centennial exposition in Chicago in 1930, commemorating America's hundred years of rail transportation.

The Portland cement industry burned 10,500,000 tons of coal and 4,400,000 bbl. of fuel oil in 1923 in the production of cement, while 16,000,000 lb. of explosives were used in producing the raw materials. The industry maintains over 225,000,000 cloth sacks in service and required the equivalent of a strip of cloth 34,000 miles long to replace the sacks not returned in 1923.

An order has been placed by the Southern Pacific with the American Locomotive Company for one new three-cylinder "Southern Pacific type" locomotive, which will be the largest and most powerful unarticulated locomotive in use. The principal dimensions and features are: Number of cylinders, three; number of pairs of drivers, five; outside diameter of driving tires, 63½ in.; boiler pressure, 225 lb.; weight on drivers, 310,000 lb.; and total weight, 438,000 lb.

On October 11, the Michigan Central brought to bearing the two halves of its new arch across the Niagara river gorge with the result that the second longest railway arch bridge in America became a self-supporting structure. The new bridge is located in the space between the old cantilever structure and the 550-ft. arch span of the Canadian National. It has a span of 640 ft. from center to center of the hinge pins and a rise of 105 ft. It is designed to carry two railway tracks on the deck at 13 ft. centers.

The construction of the Moffat tunnel on the line of the Denver & Salt Lake, west of Denver, Colo., is steadily being pushed to completion. Actual construction work has been carried on for the last 12 months with the result that headings have been completed for nearly one-third of the total length of 6.1 miles. When completed this will constitute America's longest railway tunnel, the chief result of which will be to lower the maximum elevation of the lines from 11,660 ft. to 9,240 ft. and the maximum grade from 4 per cent to 2 per cent. Work is being pushed from both ends.

The highest revenue car loadings for any week of the year were reached during the week ended October 25, with a total of 1,112,345 cars. This was an increase of over 10,000 cars as compared with the previous week and an increase of 38,504 cars as compared with the corresponding week of last year. This is the highest record for weekly car loadings in any year. The car loadings for the following week decreased nearly 37,000 but were still 37,581 cars more than were loaded during the corresponding week of last year, and an increase of 93,579 cars as compared with 1922.

Railway taxes made a new high record in September, the last month of record, when they reached the total of $33,586,622. This was $4,381,290 more than the taxes in September, 1923. In the first nine months of 1916 before any general advance in freight rates had been made railway taxes averaged $425,271 a day. In the first nine months of 1923 they were $909,587 a day. In the first nine months of 1924 they were $929,262 a day, an increase over 1916 of almost $504,000 a day. While railway operating expenses have been reduced almost 25 per cent within the last four years, railway taxes have been increased over 35 per cent.

The Bureau of Standards of the Department of Commerce has begun tests to determine which type of welded joint will last longest under traffic. Specimens of every type in common use will be included in this investigation which is being carried out by connecting the joint under test with two lengths of rail and mounting the specimen on two supports which rest upon a heavy spring-supported anvil. A power hammer weighing 400 lb. strikes the joint at the rate of one blow per second. The tests are being carried out in cooperation with the Welded Rail commission of the American Bureau of Welding and the American Electric Railway Association and are expected to produce information of value to steam roads.

The Interstate Commerce Commission has issued an accident bulletin containing the record of collisions, derailments and other accidents occurring on the railroads of the United States during the 12 months ending December, 1923, which shows a total number of casualities for the year 1923 of 179,097, including 7,385 persons killed and 171,712 injured. There were 2,258 persons killed and 6,314 persons injured at highway crossings in 1923 as compared with 1,810 persons killed and 5,383 persons injured in 1922. There were 258,786 grade crossings in 1923, of which 243,786 were with highways. The compilation shows that 1,130 crossings were eliminated in 1923, although the total number is 2,424 greater than the number for 1922.

Three large railway fires have occurred within a month with a total estimated loss to the railroads of $3,500,000. The first of these fires occurred on October 24, when ore docks No. 3 and 4 of the Chicago & North Western at Escanaba, Mich., were completely destroyed with a loss estimated at $1,500,000. At the time of the fire dock No. 3 was being November 8, three large docks, together with a number of razed preparatory to constructing a new ore dock. On buildings belonging to the Bangor & Aroostook at Stockton Springs, Me., were destroyed resulting in a loss estimated at $500,000. The third and largest fire occurred on November 16 when piers No. 5 and 6 of the Erie railway at Jersey City, N. J., together with 14 barges and large quantities of freight, were destroyed by a fire started from an unknown cause entailing a damage of $1,500,000.

Pennsylvania Awards Prizes

The Eastern region of the Pennsylvania has awarded the following prizes to supervisors and assistant supervisors on its main line divisions: The principal, or Klondike prize, which is given for maintaining the best line and surface between New York and Altoona, and between Philadelphia and Washington, was awarded to A. E. Preble, supervisor, and Wesley de Valinger, assistant supervisor, Middletown, Pa. This prize amounts to $1,200, of which the supervisor receives $800 and the assistant supervisor $400. The prize for the greatest improvement made during the year in line and surface between the same points, amounting to $1,000, was awarded to C. S. Hager, supervisor, and C. A. Robeson, assistant supervisor, Newport, Pa. The supervisor's share of

this prize is $700 and the assistant's $300. Three additional prizes of $800 each, $600 for the supervisor and $200 for the assistant supervisor, were awarded as follows: J. A. McIntyre, supervisor, and Albert Cross, assistant supervisor, Mifflin, Pa.; L. S. C. Pie, supervisor, and George H. Schlotterer, assistant supervisor, New Brunswick, N. J., and E. L. Koch, supervisor, and E. L. Smith, former assistant supervisor, Chester, Pa.

Labor News

Decisions of the Labor Board

Among recent decisions of the United States Railroad Labor Board is one relating to employees of the maintenance of way department and because it concerns important points of issue it is reviewed in considerable detail below:

Who Shall Represent Foremen?

The United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers appealed to the Labor Board for the right to represent maintenance of way foremen employed by the Oregon-Washington Railroad & Navigation Company, a subsidiary of the Union Pacific System. On June 29, 1913, the Labor Board rendered Decision No. 1835 on a dispute between the brotherhood and the Union Pacific System. This decision arose from a protest of the brotherhood against the taking of a separate ballot for (a) bridge and building maintenance of way foremen and (b) bridge and building mechanics and their helpers to determine representation in agreement negotiations. The board decided at that time that the foremen composed a separate and distinct class of employees and as such had the right to form an organization of their own for the purpose of negotiating an agreement. It also upheld the course pursued by the road and decided that the election conducted by it resulted in a vote of 1,398 in favor of the foremen's association and 193 in favor of the brotherhood. The road then conducted negotiations with the foremen's association which resulted in an agreement being entered into, effective August 1, 1923, which agreement is still in force. No evidence was presented in the recent controversy which indicated that the foremen's association had requested an abrogation of this agreement.

The brotherhood claimed that a petition was filed with it by a large number of foremen requesting that a secret ballot be taken on the O. W. R. & N. for the purpose of determining the kind of representation desired by a majority of the foremen on this portion of the system. A conference of representatives of the parties to this dispute was subsequently held, at which the brotherhood requested the O. W. R. & N. to participate in the taking of a secret ballot. It refused to concur in the suggestion of the road that a communication be addressed to the foremen's association outlining the position of the brotherhood and requesting advice from the foremen's association whether it would be willing to become a party to the election, and proceeded on its own initiative to conduct a secret ballot which it claimed indicated that of 173 votes cast, 129 desired representation by the brotherhood. The road refused to recognize the result of this ballot, reaffirming its position that the foremen's association should be a party to any such election. The road and the foremen's association also insisted that as the existing agreement covers the class of employees in question on the entire Union Pacific System it should not be altered to apply only to the employees on the Oregon-Washington Railroad & Navigation Company.

In its decision, the Labor Board held that the evidence did not show that a majority of the foremen covered by the agreement had indicated a desire to change the form of representation. It also held that the Union Pacific System is the proper unit for the negotiation of agreements, although the road and its employees may negotiate or consent to the negotiation of agreements applicable only to a constituent property of the system. It, therefore, denied the claim of the brotherhood for representation on the O. W. R. & N. as a result of the ballot taken by it. (Decision No. 2634, October 3, 1924.)

Personal Mention

General

J. J. Pelley, general manager and formerly a roadmaster on the Illinois Central, with headquarters at Chicago, has been elected vice-president, in charge of operation, with the same headquarters. Mr. Pelley was born on May 1, 1878, at Anna, Ill. He entered railway service in 1900 as a track apprentice on the Carbondale division of the Illinois Central. He was promoted to supervisor on the Indiana division in 1904, and in the following year was transferred to the Memphis division. He was promoted to roadmaster of the Louisiana division in 1908 and held that position until 1911, when he was transferred to the Tennessee division. Mr. Pelley was promoted to superintendent of the Tennessee division in 1912. He was promoted to general superintendent in 1917 and continued in that capacity until 1920 when he withdrew temporarily from the service of the Illinois Central to engage in work with the Car Service Division of the American Railway Association. He returned to the Illinois Central as general manager on April 1, 1923.

J. J. Pelley

Elisha Lee, regional vice-president of the Pennsylvania, with headquarters at Pittsburgh, and formerly an engineering officer, has been elected vice-president in charge of operation, to succeed W. W. Atterbury, who has been elected senior vice-president, effective November 15. **T. B. Hamilton**, general manager of the Northwestern region at Chicago, and formerly an engineering officer has been appointed vice-president of the Northwestern region, to succeed E. T. Whiter, who has been transferred to Pittsburgh to succeed Mr. Lee. Mr. Hamilton will also discharge the duties of general manager at Chicago.

Mr. Lee was born in 1870 at Chicago. He graduated from the Massachusetts Institute of Technology in 1892 and in that year entered the Pennsylvania as rodman on the Tyrone division. He was afterward assistant supervisor, assistant engineer in the maintenance of way department, and principal assistant engineer of the Philadelphia, Baltimore & Washington. In 1909 he became superintendent of the New York, Philadelphia & Norfolk, and in 1911 was made assistant

Elisha Lee T. B. Hamilton

to the general manager of the Pennsylvania, Lines East. He became general superintendent of the Philadelphia, Baltimore & Washington on April 1, 1914. On May 1, 1916, he became assistant general manager, and on April 1, 1917, general manager of the Pennsylvania, Lines East. Following the departure of General Atterbury for France, Mr. Lee was acting vice-president in charge of operation, and from June 1, 1918, to the termination of federal control he was federal manager of the Pennsylvania, Lines East. Upon the restoration of the railroads to their owners, Mr. Lee became vice-president in charge of the Eastern region, with headquarters at Philadelphia, and since October 24, 1923, has been vice-president in charge of the Central region, with headquarters at Pittsburgh.

Mr. Hamilton was born in 1865 at Columbus, Ohio, and graduated from Princeton University in 1888, when he entered the railroad's employ as a rodman on the Louisville division. Subsequently he served on the engineering corps as assistant engineer and engineer of maintenance of way on various divisions. He became superintendent of the Erie & Ashtabula division in 1901, and of the Cleveland & Pittsburgh division in 1903. In 1912 he became general superintendent of the then existing Central system, Pennsylvania, Lines West, and on February 1, 1914, became general manager of the Vandalia. When the latter was merged with the "Pan-Handle" he was elected resident vice-president of the Pennsylvania System at St. Louis and since the termination of federal control has been general manager of the Northwestern region.

Engineering

F. R. Puder has been promoted to division engineer of the Green River division of the Denver & Rio Grande Western, with headquarters at Grand Junction, Colo., to succeed **H. C. Cosand**, resigned.

F. C. Lewis, roadmaster of the Empress subdivision of the Canadian Pacific, with headquarters at Regina, Sask., has been promoted to division engineer of the Regina division, with the same headquarters.

J. L. Campbell, chief engineer of the El Paso & Southwestern, with headquarters at El Paso, Tex., has been appointed assistant to the chief engineer of the Southern Pacific, with headquarters at San Francisco, Cal., a newly created position pursuant to the acquisition of the El Paso & Southwestern by the Southern Pacific.

H. E. Stansbury, resident engineer of the Eastern division of the El Paso & Southwestern, with headquarters at Tucumcari, New Mex., has been appointed division engineer of the New Mexico division of the Southern Pacific, with headquarters at El Paso, Tex. **F. L. Guy**, resident engineer of the Western division of the E. P. & S. W., with headquarters at Douglas, Ariz., has been promoted to division engineer of the Rio Grande division, with headquarters at El Paso.

J. A. Bell, division engineer of the Shreveport division of the Southern Pacific, Texas lines, with headquarters at Houston, Tex., has been appointed assistant division engineer, pursuant to a consolidation of the Shreveport division with the Beaumont division of the Texas & New Orleans. Other changes include the transfer of **J. H. Knowles**, division engineer of the Galveston division of the Texas & New Orleans, to the combined Beaumont and Shreveport divisions, while the Galveston division has been placed under the jurisdiction of **P. M. Staples**, division engineer at San Antonio, Tex.

John Wilson Orrock, whose promotion to engineer of buildings of the Canadian Pacific, with headquarters at Montreal, Que., was reported in the July issue, was born in Edinburgh, Scotland, and received his early education in Scotland as an engineering apprentice. He entered railway service in 1891 as a draftsman in the engineering department of the Canadian Pacific at Montreal, and continued in this capacity until 1896, when he was promoted to assistant engineer. He served as an assistant engineer until 1906, when he was promoted to chief draftsman in the engineering department of the Canadian Pacific. In 1911 he was promoted to division engineer at North Bay, Ont., and became principal assistant engineer, system, with headquarters at Montreal in 1913, the position he was holding at the time of his promotion to engineer of buildings, upon the resignation of **C. H. Mapes.**

Vance Sykes, division engineer of the Seaboard Air Line, with headquarters at Hamlet, N. C., has been promoted to district engineer maintenance of way of the Northern district, with the same headquarters. **W. D. Simpson**, division engineer at Tampa, Fla., has been promoted to district engineer maintenance of way of the Southern district, with headquarters at Jacksonville, Fla. **O. F. McNairy**, division engineer at Jacksonville, has been transferred to the North Carolina division, with headquarters at Hamlet, succeeding Mr. Sykes. **C. A. Henderson** has been appointed division engineer of the South Carolina division, with headquarters at Jacksonville, succeeding Mr. McNairy. **C. M. Cannon**, division engineer at Savannah, Ga., has been transferred to the Florida division, with headquarters at Tampa, succeeding Mr. Simpson. **R. L. Tatum** has been appointed division engineer of the Alabama division, with headquarters at Savannah, succeeding Mr. Cannon.

Mr. Sykes, promoted as noted above was born at Efland, N. C., on February 28, 1882, and was graduated from the North Carolina State College in 1907. After serving as an instructor in civil engineering for two years Mr. Sykes entered railway service as a resident engineer on construction work with the Seaboard Air Line on May 26, 1909. He was promoted to division engineer, with headquarters at Atlanta, Ga., on December 23, 1917, and was subsequently transferred to Savannah, Ga., in June, 1918, and to Hamlet on January 1, 1920, remaining in this capacity until his recent promotion to district engineer maintenance of way.

Mr. Tatum was born at Jerusalem, N. C., on April 7, 1882. He graduated from the North Carolina State College of Agriculture and Engineering in May, 1916, and on June 1, of the same year became a roadway apprentice on the Southern, which position he held until July 1, 1917, when he entered the United States Army, engaging in roadway construction. He re-entered railway service on April 10, 1919, in the maintenance department of the Southern, and on October 15, 1919, again left railway service to become a resident engineer in the North Carolina highway department. On June 25, 1923, he became assistant to the division engineer on the Seaboard Air Line, and in September, 1923, was appointed assistant division engineer, holding this position until his recent appointment to division engineer, effective November 1, 1924.

George A. Noren, whose promotion to designing engineer of the New York Central, with headquarters at New York, was announced in the November issue, was born on April 6, 1886, at New Britain, Conn. He was graduated from the University of Pennsylvania in 1910 and entered railway service in June of that year as a rodman on the Pennsylvania. In October of the next year he left railway service to become assistant engineer for the Monterey Electric Railway Light & Power Company, Monterey, Mexico, and in May, 1912, entered private practice at Monterey. Later in the same year he re-entered railway service as an assistant engineer on the four-tracking improvement on the Hudson River division of the New York Central and in February, 1916, became assistant engineer on the preliminary and final location of the river crossing and west approaches for the Hudson River Connecting Railroad (now a part of the New York Central) near Castleton, N. Y. He was promoted to resident engineer of the New York Central at Poughkeepsie, N. Y., on station improvements in December, 1916, and in April of the following year he was promoted to

George A. Noren

assistant district engineer of the Eastern district. In February, 1920, Mr. Noren was promoted to engineer of grade crossings, with headquarters at New York, which position he held until the time of his recent promotion to designing engineer.

R. E. Dougherty, whose promotion to special engineer to the vice-president of the New York Central was noted in the November issue, was born at New York City on February 13, 1880, and graduated from Columbia University in 1901. He entered railway service with the New York Central on September 30, 1902, as a rodman and was subsequently promoted progressively to transitman, inspector and assistant engineer on construction on the Middle district. In December, 1904, he was appointed assistant engineer on grade crossing elimination, yard design, etc., with headquarters at New York, serving in this capacity until September, 1905, when he was promoted to resident engineer in charge of construction on the Eastern district. In 1907 he was promoted to assistant district engineer, serving in this capacity until 1910, when he was promoted to district engineer. In 1918 he was promoted to designing engineer, with jurisdiction over the lines east of Buffalo and with headquarters in New York City, remaining in this position until his recent promotion to special engineer as already noted.

M. B. Kent, whose promotion to assistant engineer of structures on the International-Great Northern, with headquarters at Palestine, Tex., was reported in the November issue, was born on April 24, 1888, at St. Louis, Mo., and graduated from the University of Southern California in 1907. He entered railway service as a rodman on the Southern Pacific in 1907 and served as rodman and instrumentman for a year, when he became chief computer of a railway in the West Indies. After a year in this service he left engineering work, but returned again in 1910 as an employee of the Missouri Valley Bridge & Iron Company in Texas. He entered the service of the International-Great Northern in August, 1910, as an employee in the bridge and building department at Taylor, Tex., where he served consecutively as rodman and instrumentman until January, 1915, when he was promoted to assistant engineer at San Antonio, Tex. He was promoted to resident engineer in July, 1916, but left this position in 1917 to enter military service as a captain with the American Expeditionary Forces. Returning to the International-Great Northern in July, 1919, he served consecutively as instrumentman and assistant engineer until December, 1920, when he was promoted to division engineer. In February, 1921, he became roadmaster and served in this capacity until May, 1922. He was serving as assistant engineer in the district engineer's office at San Antonio at the time of his promotion to assistant engineer of structures.

Track

J. F. Reilly, section foreman on the Lehigh Valley, has been promoted to supervisor of track at Lehighton, Pa., succeeding **R. M. Cunningham**, who has resigned.

E. C. Carter has been promoted to district roadmaster on the Cascade division of the Great Northern, with jurisdiction from Wenatchee, Wash., to Skykomish, with headquarters at Tye, Wash., to succeed **S. Jensen**, who has been assigned to other duties.

J. T. Sturman, supervisor of track on the Reading, with headquarters at Philadelphia, Pa., has been transferred to Trenton Junction, N. J., succeeding **W. A. Clark**, furloughed on account of illness. **J. F. Sherron, Jr.**, assistant supervisor of track at Philadelphia, Pa., has been promoted to acting supervisor to succeed Mr. Sturman.

D. Bradshaw, section foreman on the Saskatchewan district of the Canadian Pacific, with headquarters at Chaplin, Sask., has been promoted to roadmaster of the Matador and McMorran subdivisions; **C. E. Mateson**, section foreman at Rush Lake, has been promoted to roadmaster of the Shamrock and Vanguard subdivisions, and **W. Christianson**, section foreman at Ingolf, has been promoted to roadmaster of the Tisdale subdivision.

J. S. Carroll has been appointed assistant roadmaster on the Strong City, Minneapolis and Salina districts of the Atchison, Topeka & Santa Fe, with headquarters at Abilene, Kan., to succeed **Noah Bridges**, who has been promoted to roadmaster of the Second district from Eleanor, Kan., to Augusta, El Dorado district from Augusta to Winfield Junction, and on the Third district from Winfield Junction, Kan., to Arkansas City, with headquarters at Arkansas, Kan., to succeed **William Eglington**, deceased.

J. D. Sullivan, acting roadmaster on the Southern Illinois division of the Chicago & North Western, has been promoted to roadmaster at Huron, S. D., to succeed **E. W. Bandy**, deceased. **J. J. Wise** has been promoted to roadmaster on the Eastern division, with headquarters at Norfolk, Neb., to succeed **J. B. Lakin**, who has been transferred to succeed **J. C. Spellman**, deceased. **T. Jozwiak**, acting roadmaster on the Ashland division, has been promoted to roadmaster at Clintonville, Wis., to succeed **W. A. Brandt**, deceased.

J. F. Campbell, Sr., whose appointment to acting roadmaster on the Missouri Pacific, with headquarters at Gurdon, Ark., was reported in the November issue, was born on June 11, 1892, at Malvern, Ark. He entered railway service on March 11, 1907, as a section laborer on the Missouri Pacific, which position he held until September 8, 1912, when he was promoted to section foreman. On July 4, 1917, he was promoted to assistant roadmaster and from August 10, 1917, to March 1, 1921, served as section foreman, on the latter date being appointed extra gang foreman. On December 15, 1923, he was promoted to acting roadmaster and from May 10, 1924 to July 14, 1924, served as rail inspector, returning to the position of extra gang foreman on the latter date, which position he was holding at the time of his recent appointment to acting roadmaster.

J. P. Morgan, roadmaster on the Seaboard Air Line, with headquarters at Hamlet, N. C., has been promoted to general roadmaster with the same headquarters. Mr. Morgan was born in Person County, N. C., on March 23, 1871, and entered railway service as a section laborer on the Southern Railway at Connelly Springs, N. C., on December 2, 1889. On January 1, 1895, he was promoted to section foreman, serving in this capacity until September 1, 1896, when he left the Southern to enter the employ of the Seaboard Air Line as a section foreman, from which position he was subsequently promoted to extra gang foreman on May 14, 1900, and to roadmaster at Hamlet on April 1, 1903. On October 10, 1909, he was transferred to the North & South Carolina, now a part of the Seaboard, as general construction foreman, returning to the main system on December 1, 1915, as a roadmaster at Charleston, S. C. He was later transferred to Abbeville, S. C., and to Hamlet, where he continued to serve as roadmaster until his recent promotion to general roadmaster.

J. B. Austin, whose promotion to supervisor of track on the Southern was reported in the November issue, was born on November 6, 1892, at Edwardsville, Ala., and entered railway service in 1914 as a track laborer on the Southern. He was promoted to assistant foreman in July, 1917, and to section foreman on February 24, 1919, which position he was holding when promoted to supervisor of track.

J. B. Wallace, whose promotion to track supervisor on the Southern, with headquarters at Williamson, Ga., was reported in the November issue, was born on December 16, 1876, at Waverly Hall, Ga., and entered railway service in 1897 as a section laborer on the Southern. He became a track apprentice in 1898 and after serving in this capacity a year was promoted to section foreman. In 1914 he was appointed track inspector and served in this capacity until the completion of the work assigned, when he returned to Waverly Hall as section foreman, where he served continuously until his recent promotion to supervisor.

T. B. Cobb has been promoted to roadmaster on the St. Louis, San Francisco & Texas, with headquarters at Fort Worth, Tex., to succeed **E. G. Lang**, resigned. Mr. Cobb was born on December 28, 1881, at Tupelo, Miss., and entered railway service in 1888 as an extra gang laborer on the Missouri-Kansas-Texas. He served consecutively as an extra gang laborer, a general foreman of a surfacing gang and as an extra gang foreman until August 16, 1905, when he was

promoted to yard foreman. From December 1, 1908, to October, 1916, he was engaged as a general foreman with the W. M. Kenific Construction Company, whereupon he again became a yard foreman on the Missouri-Kansas-Texas. On January 1, 1921, he became yard foreman on the St. Louis Southwestern and on July 20, 1922, was appointed to a similar position on the St. Louis, San Francisco & Texas. He was serving as acting roadmaster on the St. Louis, San Francisco & Texas at the time of his recent promotion to roadmaster.

Bridge and Building

C. E. Smith has been appointed fire and safety inspector of the New York, Chicago & St. Louis, with headquarters at Cleveland, Ohio, a newly created position.

W. T. Sprague, supervisor of bridges and buildings on the Southern Pacific lines, with headquarters at Houston, Tex., has been appointed assistant supervisor of bridges and buildings of the Beaumont division of the Texas & New Orleans, following the consolidation of the Shreveport division and the Beaumont division.

W. J. Dunaway, whose promotion to supervisor of bridges and buildings on the Southern was reported in the November issue, was born on June 4, 1889, at Lincoln, Ala., and entered railway service on October 28, 1906, as a bridge laborer. He was appointed a pile driver engineer in 1907, and subsequently served as a steam shovel engineer until December 28, 1911, when he was promoted to bridge foreman. He was serving as bridge foreman at the time of his promotion to supervisor of bridges and buildings, with headquarters at Wilkin, Ala.

Purchases and Stores

James E. Kilborn, purchasing agent of the Rutland, with headquarters at Rutland, Vt., has resigned, effective November 15.

L. G. Pearson, general storekeeper of the El Paso & Southwestern, has been appointed district storekeeper of the new Eastern district of the Southern Pacific, with headquarters at El Paso, Tex.

G. T. Richards, assistant district storekeeper of the Chicago, Milwaukee & St. Paul at Dubuque, Iowa, has been promoted to district storekeeper of the Southern district, with the same headquarters, succeeding J. E. Dexter, deceased.

Obituary

John M. Meade, formerly engineer of the Eastern lines of the Atchison, Topeka & Santa Fe, died on October 31. He was born on November 1, 1853, at Nineveh, Pa., and entered railway service in June, 1873, as a chainman on the Baltimore & Ohio. In May, 1877, he was appointed chief clerk to the superintendent of bridges and buildings of the Atchison, Topeka & Santa Fe, and in June of the following year was promoted to foreman of the lumber yard. He was promoted to assistant division engineer in April, 1881, and, in November, 1881, was promoted to resident engineer. He was appointed assistant engineer in charge of engineering work in the operating department for the entire system in May, 1886, and in August of the following year was appointed assistant engineer of the Eastern division in charge of bridges, buildings and water service. Mr. Meade was appointed resident engineer at Topeka, Kans., on March 1, 1888, and held that position until July, 1893, when he was transferred to the Western Grand division. He later served as resident engineer on the Middle and Eastern division and the Chicago and Eastern division, remaining in the latter position until July, 1903, when he was promoted to acting engineer of the Eastern Grand division. Mr. Meade was promoted to engineer of the Eastern Grand division in July, 1904, and in April, 1909, he was promoted to engineer of the Eastern lines, with headquarters at Topeka, Kans. He was appointed special engineer of the entire Santa Fe system on July 1, 1915, and remained in that position until his retirement from active service in June, 1919. He was active in the Roadmasters' Association, having been president of that organization in 1901.

John M. Meade

E. W. Bandy, roadmaster on the Southern Illinois division of the Chicago & North Western, and **W. A. Brandt,** roadmaster at Clintonville, Wis., are among the recent deaths in the maintenance department. Their successors are reported elsewhere in this issue.

Richard Heffron, supervisor of track on the Chicago & Alton, with headquarters at Alton, Ill., died in that city on November 21, following an operation for appendicitis. Mr. Heffron had been in the employ of the Chicago & Alton for about 40 years. He served as section and extra gang foreman for a number of years and had been supervisor for about 12 years, with headquarters at both Bloomington and Alton.

Robert H. Reid, supervisor of bridges on the New York Central, with headquarters at Cleveland, Ohio, whose death on October 15, was reported in the November issue, was born on February 8, 1865, and studied at the Case School of Applied Science, graduating in 1889. He entered railway service on October 1, 1890, as a bridge inspector on the Lake Shore & Michigan Southern (now a part of the New York Central), and served in this capacity until March 1, 1896, when he was promoted to general bridge foreman. He continued as general bridge foreman on the Lake Shore & Michigan Southern and in the same capacity after this road became part of the New York Central, until January 11, 1906, when he was promoted to supervisor of bridges, with general charge of all outside bridge forces and supervision over all bridge maintenance work as well as over a portion of the new construction jobs. Although becoming a victim of malignant tumor three years ago, Mr. Reid continued in active duty as supervisor of bridges to within less than 24 hours of his death. Mr. Reid was president of the American Railway Bridge and Building Association during 1908.

Robert H. Reid

The Castleton cut-off of the New York Central near Albany, N. Y., was formally opened on November 20 by a special party made up of directors and officers of the railroad and their guests. Special trains were operated from New York and from the east and the west to Albany where a party of approximately 800 was taken over the new work on a special train, the first to cross the new high-level bridge over the Hudson river, now called the Alfred H. Smith Memorial bridge in honor of the late president of the road who originated the project. The cut-off comprises about 28 miles of double track connections, a high level bridge approximately one mile long and a large modern freight yard and engine terminal. The inspection was followed by a luncheon at the Hotel Ten Eyck at which a number of addresses were made. Nearly 30 railway presidents and chairmen of boards attended the opening of the cut-off, in addition to a large representation of other railway officers and of national, state and municipal officers.

Construction News

The Atchison, Topeka & Santa Fe plans the construction in 1925 of second main track on its line from San Diego, Calif., to Fullerton, and from San Bernardino to Riverside, a total distance of 34 miles. This company has awarded a contract to Robert E. McKee, San Diego, Cal., for the construction of an addition to the boiler shop at San Bernardino, Cal. The addition will be constructed of steel and reinforced concrete.

The Atlantic Coast Line has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 500-ton reinforced concrete four-track coaling station at Bennetts yard, Charleston, S. C.

The Beaver, Meade & Englewood has applied to the Interstate Commerce Commission for a certificate authorizing the construction of an extension from Hooker, Okla., to Des Moines, N. M., 175 miles.

The Canadian National will proceed at once with the construction of a 21-mile branch line from Turtleford, Sask., to Hafford.

The Central of New Jersey has awarded a contract to Henry Steers, Inc, for the construction of viaduct piers at the east end of its new bridge over Newark bay at an estimated cost of $152,820

The Chesapeake & Ohio has awarded a contract to the Chicago Bridge & Iron Works for the erection of a 50,000-gal. steel tank on an 18-ft tower at Anthony, W. Va. A contract has been awarded to the same company for the erection of a steel standpipe 24 ft. in diam. and 55 ft. high at Stevens, Ky. This company has awarded a contract to Joseph E. Nelson & Sons, Chicago, for 17,000 ft. of 12-in. cast iron pipe, three 10-in. water columns and the foundations for a 40-ft. by 50-ft. steel tank at Russell, Ky.

The Chicago, Burlington & Quincy, jointly with the Chicago, Rock Island & Pacific, the Atchison, Topeka and Santa Fe and the city of St. Joseph, Mo., will construct a viaduct across the railways' tracks at Sixth street, in St. Joseph, at an estimated cost of $133,000.

This company, jointly with the Colorado & Southern and the city of Denver, Colo., has reached an agreement under which the channel of the Platte river will be widened to prevent floods, at an estimated cost of $100,000.

This company plans the construction of a nine-mile spur from Keensburg, Colo., to Roggen. This company has also awarded a contract for the construction of a freight house at Denver, Colo., to Allison Stoker.

The Cleveland, Cincinnati Chicago & St. Louis has awarded a contract to the Roberts & Schaefer Company, Chicago, for an electric cinder plant to be installed at Lafayette, Ind.

The Delaware, Lackawanna & Western has awarded a contract to the Chicago Bridge & Iron Works for the furnishing and erection of a 200,000-gal. steel tank at the engine terminal now under construction at Binghamton, N. Y.

The Erie has awarded a contract to the Bates & Rogers Construction Company, Chicago, for the construction of a viaduct 600 ft. long over its tracks at Barberton, Ohio.

The Florida press has announced that a New York group, including Baron G. Collier and Cornelius Vanderbilt, Jr., is contemplating the construction of a new railroad across the Everglades from Miami, Fla., to Fort Myers.

The Grand Trunk has closed bids for the construction of an extension, 105-ft. by 80-ft., to an ice storage house at Port Huron, Mich., to cost $40,000. This company is constructing with company forces 13 miles of second main track on its freight line between Swartz creek and Belsay, Mich. This project involves the construction of four bridges and will cost $600,000. Company forces are also constructing eight additional tracks with a capacity of 600 cars in the Belsay yards at Flint, Mich., and a west bound passing track of 105 cars capacity at Belsay, the projects to cost $175,000.

This company has awarded a contract to the Chicago Bridge & Iron Works, Chicago, for the erection of a 100,000-gal. steel water tank at Lapeer, Mich., and a 50,000-gal. steel water tank at Greenville, Mich., to cost $17,000.

The Great Northern has authorized the construction of a terminal postoffice station at Seattle, Wash.; the enlarging of the tie treating plant at Somers, Mont.; second track at Kelly Lake, Minn., to Emmert; additional yard tracks at Allouez, Wis.; the replacement with new steel of the old steel in the bridge over the west channel of the Mississippi river at Minneapolis, Minn.; and connecting tracks from the bridge to the passenger station, including 268 ft. of new steel bridge. to the passenger station, which will include 268 ft. of new steel bridge.

The Gulf Coast Lines have awarded a contract to the Orange Car & Steel Company, Orange, Tex., for the construction of a machine shop, power house and store house at Dequincy, La., at a cost of approximately $50,000.

The Illinois Central has awarded contracts for its proposed 165 mile cut-off line from Edgewood, Ill., to Fulton, Ky., as follows: Section No. 1, from Edgewood to the Marion county line, 15 miles, to T. E. Shugart and Blythe Bros.; Section No. 2, from the Marion county line to Akin Junction, 35 miles, to John Marsh, Chicago; Section No. 3, from Akin Junction, Ill., to Benton, 15 miles, to T. E. Shugart and Blythe Bros.; Section No. 4, from Benton to Big Four Crossing, 25 miles, to the States Contracting Company, Chicago; Section No. 5, from the Big Four Crossing to Reevesville, 15 miles, to A. Guthrie, Chicago; Section No. 6, from Reevesville to Metropolis, 15 miles, to the Flick Construction Company, Chicago; Section No. 7, from Metropolis, Ill., to Little Mayfield Creek, Ky., 30 miles, to the Dominion Construction Company, and Section No. 8, from Little Mayfield Creek to Fulton, Ky., 25 miles, to the H. W. Nelson Company, Chicago.

This company closed bids on November 17 for the construction of a 1,200-ton coaling station at Markham yard, Chicago.

This company also has plans for the construction of a 50-stall roundhouse at Markham yard.

The Laurel Fork & Mendota, in a report made by Attorney Examiner C. E. Boles and Engineer Examiner E. Gray, has been refused authority to construct and partly acquire a line from Saltville to Mendota, Va., 36 miles long, on the grounds that public interest does not require this.

The Long Island has been ordered by the New York Transit Commission to eliminate six grade crossings on its Montauk division.

The Los Angeles Junction has applied to the Interstate Commerce Commission for permission to construct eight miles of railroad in the Vernon industrial district, Los Angeles, Calif. The line will connect with all other roads serving Los Angeles, including the Pacific Electric, and will serve principally the Union Stock Yards and the Central Manufacturing District.

The Minneapolis & St. Louis contemplates the construction in 1925 of car repair shops at Clear Lake, Ia.

The Missouri-Kansas-Texas plans the construction of a roundhouse and transfer yard at Eureka, Tex., a suburb of Houston.

The Missouri Pacific has closed bids for the construction of an addition to its tool house, 35 ft. by 55-ft., at North Little Rock, Ark.

This company has awarded a contract for the construction of a fuel oil station at Ewing avenue, St. Louis, Mo., to the Railway Water & Coal Handling Company, Chicago.

This company has been authorized by the Interstate Commerce Commission to construct an extension of the Eudora branch from Epps to Delhi, La., 10.5 miles.

The National Railways of Mexico are reported contemplating the construction of a branch line from Juarez, Chihuahua, Mexico, to Ojinaga, a distance of 200 miles.

The New York Central has awarded to William M. Ballard, Inc., a contract for the extension of five stalls with roof of its enginehouse at Minoa, N. Y., and the construction of an office building at that point at an estimated cost of $50,000. A contract for the installation of a complete blow-off, washing and filling system for locomotive boilers at

East Buffalo, N. Y., has been awarded to the National Boiler Washing Company at an approximate cost of $40,000.

The Northern Pacific has dismantled the steel train-shed of the Union station at Duluth, Minn., and is now constructing an umbrella type shed over the six platforms of the station. New platforms of vitrified brick construction, with concrete curbs, are also being laid. The total cost of the project, which includes extensive renovations of the station, will be approximately $100,000.

This company plans the construction of a 15-mile extension of its Gray's Harbor, Wash., branch, to cost approximately $500,000.

The Owensboro, Rockford & Chicago, in a report made by Attorney-Examiner C. E. Boles and Engineer-Examiner E. Gray, of the Interstate Commerce Commission, has been refused permission to construct a line from Owensboro, Ky., to Elnora, Ind., 84 miles.

The Pacific Fruit Express has called for new bids for the construction of refrigerator car repair shops, paint shop and store shed at Nampa, Idaho, to cost approximately $450,000.

The Pennsylvania has awarded to the Bram & Stuart Company, Philadelphia, a contract for the reconstruction of a highway bridge over the Delaware & Raritan canal feeder at Trenton, N. J., to cost approximately $50,000, and has also awarded a contract to George F. Dobbin, Philadelphia, for the construction of an undergrade bridge at Erie avenue, Philadelphia. The work will cost approximately $60,000, to be shared in by the city of Philadelphia.

This company has awarded a contract to Roberts & Schaefer Company, Chicago, for the erection of a reinforced concrete locomotive coaling plant at the new Toledo, Ohio, terminal, and has authorized the erection of a coal-dumping machine at its docks at Sandusky, Ohio, to cost $805,000, including track and dock revisions and installation of the machine. The new machine will have a dumping capacity of 40 cars of coal an hour.

The Pere Marquette, jointly with the Grand Trunk Western, contemplates the construction of a union station at Flint, Mich.

The Roswell, Lubbock & Memphis, recently incorporated, plans the construction of a 227-mile railroad in West Texas and New Mexico. Clifford Grunewald and E. C. Noble, Houston, Texas, are two of the incorporators of the company.

The San Benito & Rio Grande has received authority from the Interstate Commerce Commission to construct a line from Santa Maria to Sammons, Tex., 30.93 miles.

The Southern plans the construction of a three-story brick and steel addition to its passenger station at New Orleans, La.

The Southern Pacific plans the immediate construction of an l.c.l. freight station at 51st and Alameda streets, Los Angeles, Calif. The freight house will be 30-ft. by 164-ft with platform long enough to accommodate 14 cars. A house track 1,440 ft. long and a team track 1,290 ft. long, will also be constructed.

The St. Louis, Brownsville & Mexico has been authorized by the Interstate Commerce Commission to construct a line from Lyford to Edinburg, Tex., 28 miles.

The St. Louis-San Francisco contemplates the construction of a freight terminal and warehouse at Birmingham, Ala., to cost approximately $1,000,000.

The Union Pacific, jointly with Los Angeles county, will construct a subway to carry Telegraph road under the Union Pacific tracks to eliminate a grade crossing, at a total cost of $107,500 to be divided equally between the county and the railroad.

The Vinita, Bartlesville & Western, which was recently organized, plans the construction of a railroad across northern Oklahoma, from Vinita to Nowata, Bartlesville, Pawhuska, Ponca City and Blackwell. C. E. Burlingame, of Bartlesville, Okla., is president of the company.

The Wabash has purchased 109 acres of land in North Kansas City, Mo., which will be used as the site for a new freight terminal. In addition to a large yard, a roundhouse, machine shop, coaling station, ice plant and office building will be constructed.

The Wisconsin Southern, of which C. P. Smith, Fond du Lac, Wis., is president, has awarded a contract to the E. Schuster Construction Company, Denmark, Wis., for the construction of an electric railway from Manitowoc, Wis., to Sturgeon Bay, a distance of approximately 60 miles.

Equipment and Supplies

The Atchison, Topeka & Santa Fe has placed orders for 85,000 tons of rail, the largest part of which went to the Colorado Fuel & Iron Company, and the remainder was distributed between the Bethlehem Steel Corporation, the Inland Steel Company and the Illinois Steel Company.

The Baltimore & Ohio has ordered 400 tons of steel for bridges from the American Bridge Company and about 500 tons for grade elimination work in Staten Island from the McClintic-Marshall Company.

This company has ordered 4,000 tons of rails from the Illinois Steel Company and 20,000 tons from the Carnegie Steel Company.

The Chesapeake & Ohio has ordered 12,000 tons of rail from the Inland Steel Company; 12,000 tons from the Illinois Steel Company, and 6,000 tons of rail from the Bethlehem Steel Corporation.

The Chicago, Milwaukee & St. Paul has ordered 68,000 tons of rails from the Illinois Steel Company and 10,000 tons from the Inland Steel Company.

The Erie has placed its orders for rails for 1925 requirements with the Carnegie Steel Company, the Bethlehem Steel Corporation, the Illinois Steel Company and the Inland Steel Company. This company has received bids on 1,200 tons of steel for a bridge at Paterson, N. J.

The Great Northern has ordered 500 tons of structural steel for bridge work from the Minneapolis Steel & Machinery Company.

The Lehigh Valley has distributed an order for 3,200 tons of steel for bridges between the Bethlehem Steel Corporation and the McClintic-Marshall Company.

The Missouri Pacific has ordered 10,000 tons of rails from the Inland Steel Company, 10,000 tons from the Illinois Steel Company, 8,000 tons from the Tennessee Coal, Iron & Railroad Company and 2,000 tons from the Colorado Fuel & Iron Company.

The New York Central has placed orders for 155,000 tons of rails, and has an option on 29,650 tons additional as follows:

	Ordered	On Option	Total
Bethlehem Steel Company	67,350	12,850	80,200
Carnegie Steel Company	15,200	1,800	17,000
Illinois Steel Company	58,600	12,000	70,600
Inland Steel Company	13,850	3,000	16,850
Totals	155,000	29,650	184,650

This company has received bids on 500 tons of steel for a bridge near Buffalo, and has inquired for 300 tons of steel for repairs to bridges in Indiana and for 1,000 tons of structural steel for grade crossing work.

The New York, Chicago & St. Louis has authorized the purchase of 20,000 tons of rail.

The Norfolk & Western has received bids on 500 tons of structural steel, for a machine shop extension at Roanoke, Va.

The Northern Pacific has ordered 15,000 tons of rail from the Illinois Steel Company.

The St. Louis-San Francisco has ordered 15,000 tons of rail from the Illinois Steel Company.

The Union Pacific has distributed an order for 55,000 tons of rail, 1,500 tons of spikes and bolts and 5,000 tons of tie plates, between the Colorado Fuel & Iron Co., the Illinois Steel Company and the Inland Steel Company.

The Wabash has divided an order for 15,000 tons of rail between the Illinois Steel Company, the Inland Steel Company and the Betlehem Steel Corporation.

Supply Trade News

General

The Economy Electric Devices Company, Chicago, has been appointed central western sales representative of the **Chausse Oil Burner Company.**

The Kalman Steel Company has removed its office from the Merchants National Bank building, St. Paul, Minn., to the Builders Exchange building, Sixth and Jackson streets.

The Austin Company has removed its San Francisco office to enlarged quarters at 244 Kearny street, and has announced the moving of its headquarters staff of the Los Angeles office into a private office building at 777 East Washington St.

The American Bridge Company has moved its Cleveland, Ohio, office to 1450 Rockefeller building.

The Northwest Engineering Company, Chicago, a manufacturer of cranes, drag lines, and shovels, has appointed the **Beckwith Machinery Company,** Pittsburgh, Pa., as its representative in that city and **The Collins-Kay Company,** Los Angeles, Calif., representative in that city. **W. W. Mutter** has been placed in charge of the newly opened office at 23 Main street, San Francisco, Calif.

Personal

Samuel Hale, formerly vice-president of the Interstate Iron & Steel Company, Chicago, died at Santa Fe, New Mex., on Oct. 25.

T. B. H. Askin has been appointed sales manager for the Intermountain division of the **American Manganese Steel Company, Incorporated,** with his headquarters at Denver, Colo.

Frederick E. Bausch, 1105 Chemical building, St. Louis, Mo., has been appointed district representative in eastern Missouri and southern Illinois, of the **Conveyors Corporation of America,** Chicago.

C. B. Mitchell, for the past 13 years with the **National Lumber & Creosoting Co.,** Texarkana, Ark., has been appointed district sales manager, with headquarters at 312 Railway Exchange building, Kansas City, Mo.

W. R. Hans, who has been in the service of the **Whiting Corporation,** Harvey, Ill., for a number of years, has been placed in charge of a new district sales office opened by that company at 997 Ellicott Square building, Buffalo, N. Y., to succeed its former agent, George F. Crivel & Company, Buffalo.

Tom Moore, 811 Royster building, Norfolk, Va., has been appointed railroad sales agent in the southeastern district for the **American Bolt Corporation,** New York. He will conduct the sales activities in the railroad and industrial field. Mr. Moore was formerly general purchasing agent of the Virginian railway.

N. P. Farrar, district manager of the Philadelphia territory for the **Pawling & Harnischfeger Co.,** Milwaukee, Wis., has been appointed assistant sales manager. **H. L. Mode** has been appointed sales representative in the eastern territory, with headquarters at New York and Philadelphia, Pa. Mr. Mode was formerly in the motor department of the General Electric Company.

Arthur Levison has been appointed chief engineer of the road building department of the **Blaw-Knox Company,** Pittsburgh, Pa. Mr. Levison has been actively connected with construction work since his graduation from New York University in 1910. He served for four years as assistant engineer of barge canal construction in New York state, and later as assistant engineer in subway construction work in New York city. Since July, 1919, he has been with the United States Bureau of Public Roads as highway engineer.

E. B. Perry, vice-president and general manager of the **Industrial Works,** with headquarters at Bay City, Mich., has been elected president and general manager to succeed **W. L. Clements** who has been elected a member of the board of directors. **H. H. Perry,** assistant to the vice-president and general manager, has been promoted to manager. **C. R. Wells,** secretary and treasurer, has been elected a member of the board of directors and will be succeeded by **N. D. Platt,** office manager, who in turn will be succeeded by **J. L. Trudell,** advertising manager, who will be succeeded by **A. R. Olson. Walter Perry,** superintendent, has been promoted to general superintendent.

E. B. Perry was born on December 9, 1868, in Prairie du Chien, Wis. He graduated from the University of Michigan in 1889, with the degree of B.S. in mechanical engineering, and on July 1 of the same year entered the employ of the Industrial Works as a draftsman and erecting engineer, which position he held until 1893, when he was promoted to superintendent. In 1895 he was promoted to manager, which position he held until 1906 when he was promoted to vice-president and general manager, which position he held until his recent promotion.

H. H. Perry was born on October 8, 1894, at Bay City, Mich. He received the degree of B.S. in mechanical engineering at the University of Michigan in 1916, the degree of M.S. at Massachusetts Institute of Technology in 1917, and the degree of M.S. from Harvard University in 1917. He entered the employ of the Industrial Works in June, 1917, and in the following month entered the U. S. Army as a first lieutenant in the Ordnance Department, in which capacity he served overseas from September, 1918, to February, 1919. On March 10, 1919, he re-entered the employ of the Industrial Works as manager's assistant, which position he has held until his recent promotion.

Mr. Olson was born on October 11, 1903, at Cooperstown, N. Dak., and graduated from the Chicago Academy of Fine Arts in June, 1923. On August 2, 1923, he entered the employ of the Industrial Works, with headquarters at Bay City, Mich., as an artist, which position he held until his recent promotion.

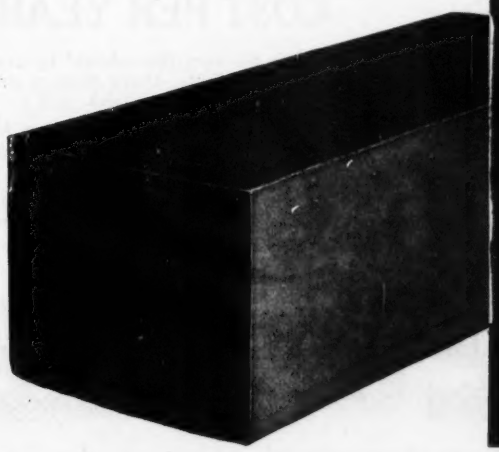
Mr. Platt was born on May 4, 1882, at Bay City, Mich., and entered the employ of the Industrial Works on October 23, 1901, as an office boy. After holding offices in the accounting and general offices, he was promoted to office manager, which position he has held until his recent promotion.

Henry R. Towne, chairman of the board of directors of the Yale & Towne Manufacturing Co., Stamford, Conn., died at his home in New York on October 15. He was born in Philadelphia, Pa., on August 28, 1844. He attended the University of Pennsylvania, from which he subsequently received the honorary degree of M.A. He first served in the drafting room of the Port Richmond Iron Works at Philadelphia. In 1866 he made an extensive tour of the leading engineering establishments in Great Britain, Belgium and France, and took a special course in physics at the Sorbonne, Paris. After returning to the United States he worked for some time in the shops of William Sellers & Co., Philadelphia. In October, 1868, he formed a partnership with Linus Yale, Jr., with Mr. Yale as president, and the Yale Lock Manufacturing Company was established at Stamford, Conn. Mr. Yale died shortly after, and in 1869 Mr. Towne became the president of the company, which at that time had a factory with 30 employees at Stamford and a sales room in New York. Mr. Towne continued as president until March, 1915, when he desired to retire from the duties of that office and was elected chairman of the board. He was president of the American Society of Mechanical Engineers in 1888 and 1889.

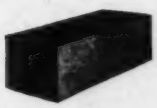
Henry R. Towne

Alton Brick Company
Alton, Ill.
Binghamton Brick Company
Binghamton, N. Y.
Cleveland Brick & Clay Company
Cleveland, Ohio
Clydesdale Brick & Stone Co.
Pittsburgh, Pa.
Coffeyville Vitrified Brick & Tile Co.
Coffeyville, Kans.
Collinwood Shale Brick Company
Cleveland, Ohio
Francis Vitric Brick Company
Boynton, Okla.
Georgia Vitrified Brick & Clay Co.
Augusta, Ga.
Globe Brick Company
East Liverpool, Ohio
Hisylvania Coal Co.
Columbus, Ohio
Hocking Valley Brick Company
Columbus, Ohio
Independence Paving Brick Co.
Independence, Kans.
Metropolis Paving Brick Co.
Pittsburg, Kans.
Metropolitan Paving Brick Co.
Canton, Ohio
Mineral Wells Paving Brick Co.
Mineral Wells, Texas
Moberly Paving Brick Company
Moberly, Mo.
Murphysboro Paving Brick Co.
Murphysboro, Ill.
Nelsonville Brick Co.
Nelsonville, Ohio
Peebles Paving Brick Company
Portsmouth, Ohio
Purington Paving Brick Company
Galesburg, Ill.
Southern Clay Mfg. Company
Chattanooga, Tenn.
Springfield Paving Brick Company
Springfield, Ill.
Sterling Brick Company
Olean, N. Y.
Streator Clay Mfg. Company
Streator, Ill.
Thurber Brick Company
Ft. Worth, Texas
Toronto Fire Clay Company
Toronto, Ohio
Trinidad Brick & Tile Company
Trinidad, Colo.
Veedersburg Paver Company
Veedersburg, Ind.
Western Shale Products Company
Fort Scott, Kans.
Westport Paving Brick Company
Baltimore, Md.

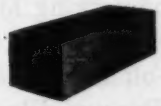
VITRIFIED
Brick
PAVEMENTS
OUTLAST THE BONDS



WHERE heavy trucks jolt and pound, — where draft-horses, delivering and taking away heavy loads, strain and lunge —where passengers, whose safety must be guarded by every precaution, hurry to their trains—these are the places where *only* vitrified brick makes the proper pavement.

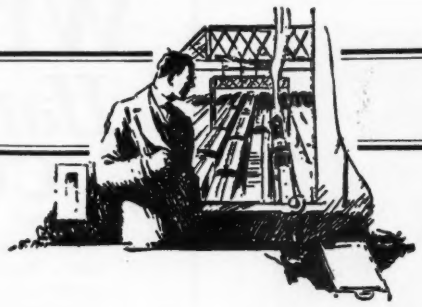


Vitrified brick alone affords long and lasting service together with the skid-proof surface which safety demands.



NATIONAL PAVING BRICK
MANUFACTURERS ASSOCIATION
ENGINEERS BUILDING CLEVELAND, OHIO

Buyers' Guide



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Northwestern Motor Co.
Woolery Machine Co.

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Pipe, Corrugated.
Armco Culvert & Flume Mfrs. Assn.
Wheeling Corrugating Co.

Pipe, Sewer.
Massey Concrete Products Corp.

Pipe Joint Compound.
Dixon Crucible Co., Jos.

Platforms, Station.
Headley Good Roads Co.

Plows, Railroad.
Western Wheeled Scraper Co.

Poles.
International Creosoting & Construction Co.
Massey Concrete Products Corp.

Pony Car.
American Trackbarrow Co.

Posts, Bumping.
See Bumping Posts.

Posts, Fence.
See Fence Posts.

Powders, Blasting.
See Blasting Powders.

Preservation, Timber.
International Creosoting & Construction Co.

Products, Gas.
Air Reduction Sales Co.

Pumps, Air Pressure and Vacuum, Centrifugal, Deep Well, Piston, Plunger, Rotary, Sump.
American Well Works.
Goulds Manufacturing Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Push & Hand Car Bearings.
Hyatt Roller Bearing Co.

Push Cars.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Woolery Machine Co.

Rail Anchors.
Lundie Engineering Corp.

Rail Anti-Creepers.
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Rail Benders.
Verona Tool Works.

Rail Bonds.
Verona Tool Works.

Rail Braces.
Bethlehem Steel Co.
Ramapo-Ajax Corp.
Wharton Jr. & Co., Wm.

Rail Joints.
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Rail Saws, Portable.
Industrial Works.
Kalamazoo Railway Supply Co.

Rail Springs.
Verona Tool Works.

Rail, Tee.
Bethlehem Steel Co.

Regulators, Oxy-Acetylene.
Air Reduction Sales Co.

Removers, Paint.
Mudge & Co.

Rivets.
Bethlehem Steel Co.

Rods, Welding.
Air Reduction Sales Co.

Roller Bearings.
Hyatt Roller Bearing Co.

Roof Slabs.
Hyatt Roller Bearing Co.

Roof Slabs.
Massey Concrete Products Corp.

Roofing Composition.
Lehon Co.

Rules.
Lufkin Rule Co.

Saw Mills.
American Saw Mill Machinery Co.

Saws, High Speed Friction.
American Saw Mill Machinery Co.

Saw Rigs.
American Saw Mill Machinery Co.

Scales.
Lufkin Rule Co.

Scoops.
Ames Shovel & Tool Co.

Scrapers, Wheel, Drag and Buck.
Western Wheeled Scraper Co.

Screw Spike Drivers.
Ingersoll-Rand Co.

Section Cars.
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Sheet Iron.
Armco Culvert & Flume Mfrs. Assn.
Wheeling Corrugating Co.

Shingles, Composition.
Lehon Co.

Shovels.
Ames Shovel & Tool Co.
Hubbard & Co.
Wood Shovel & Tool Co.

Signal Foundations, Concrete.
Massey Concrete Products Corp.

Slabs, Concrete.
Massey Concrete Products Corp.

Smoke Stacks.
Chicago Bridge & Iron Works.
Massey Concrete Products Corp.

Spades.
Ames Shovel & Tool Co.
Hubbard & Co.
Wood Shovel & Tool Co.

Spikes.
Bethlehem Steel Co.

Spreader Cars.
See Cars, Spreader.

Spreaders, Ballast.
See Ballast Spreaders.

Standpipes.
Chicago Bridge & Iron Works.

Standpipes (Penstock).
American Valve & Meter Co.

Stands, Switch & Target.
American Valve & Mater Co.
Bethlehem Steel Co.
Ramapo-Ajax Corp.

Station Houses.
Massey Concrete Products Corp.

Steel, Structural.
Bethlehem Steel Co.

Steel Forms.
Blaw-Knox Co.

Steel Plates & Shapes.
Bethlehem Steel Co.

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Switches.
Bethlehem Steel Co.
Frog Switch & Mfg. Co.
Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Switch Locks.
American Valve & Meter Co.

Switchmen's Houses.
Massey Concrete Products Corp.

Switchstands & Fixtures.
American Valve & Meter Co.
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

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Tanks, Elevated, Steel.
Chicago Bridge & Iron Works.

Tanks, Oil Storage.
Chicago Bridge & Iron Works.

Tanks, Water Storage.
Chicago Bridge & Iron Works.

Tapes.
Lufkin Rule Co.

Tee Rails.
See Rails, Tee.

Telegraph Poles.
See Poles.

Ties.
International Creosoting & Construction Co.

Tie Plates.
Bethlehem Steel Co.
Lundie Engineering Corp.

Tie Rods.
Bethlehem Steel Co.

Tie Tampers.
Ingersoll-Rand Co.

Timber, Creosoted.
International Creosoting & Construction Co.

Tool Steel.
Bethlehem Steel Co.

Tools, Acetylene Cutting & Welding.
Air Reduction Sales Co.

Tools, Pneumatic.
Ingersoll-Rand Co.

Tools, Track.
Verona Tool Works.

Tools, Wrecking.
Industrial Works.

Tongue Switches.
Bethlehem Steel Co.
Frog Switch & Mfg. Co.
Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Torches, Oxy-Acetylene Cutting & Welding.
Air Reduction Sales Co.

Track Barrows.
American Trackbarrow Co.

Track Drills.
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Track Gauges & Levels.
Kalamazoo Railway Supply Co.

Track Jacks.
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Track Liners.
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Track, Portable.
Western Wheeled Scraper Co.

Track Tools.
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Transfer Tables.
Industrial Works.

Treating Plants, Water.
American Water Softener Co.

Trestle Slabs.
Massey Concrete Products Corp.

Truss Plates.
Wheeling Corrugating Co.

Valves, Float.
American Valve & Meter Co.

Valves, Tank.
American Valve & Meter Co.

Washers, Fibre.
Diamond State Fibre Co.

Water Columns.
American Valve & Meter Co.

Water Cranes.
American Valve & Meter Co.

Water Softening Plants.
American Water Softener Co.

Water Treating Plants.
American Water Softener Co.

Water Tanks.
Chicago Bridge & Iron Works.

Water Treating Tanks.
Chicago Bridge & Iron Works.

Waterproofing Fabrics.
Lehon Co.

Welding, Oxy-Acetylene.
Air Reduction Sales Co.

Welding & Cutting Equipment.
Air Reduction Sales Co.

Wheels, Hand & Motor Car.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Wire Fencing.
Cyclone Fence Co.

Wood Grapples.
Industrial Works.

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Woodworking Machinery.
American Saw Mill Machinery Co.

Wrecking Cranes.
Industrial Cranes.

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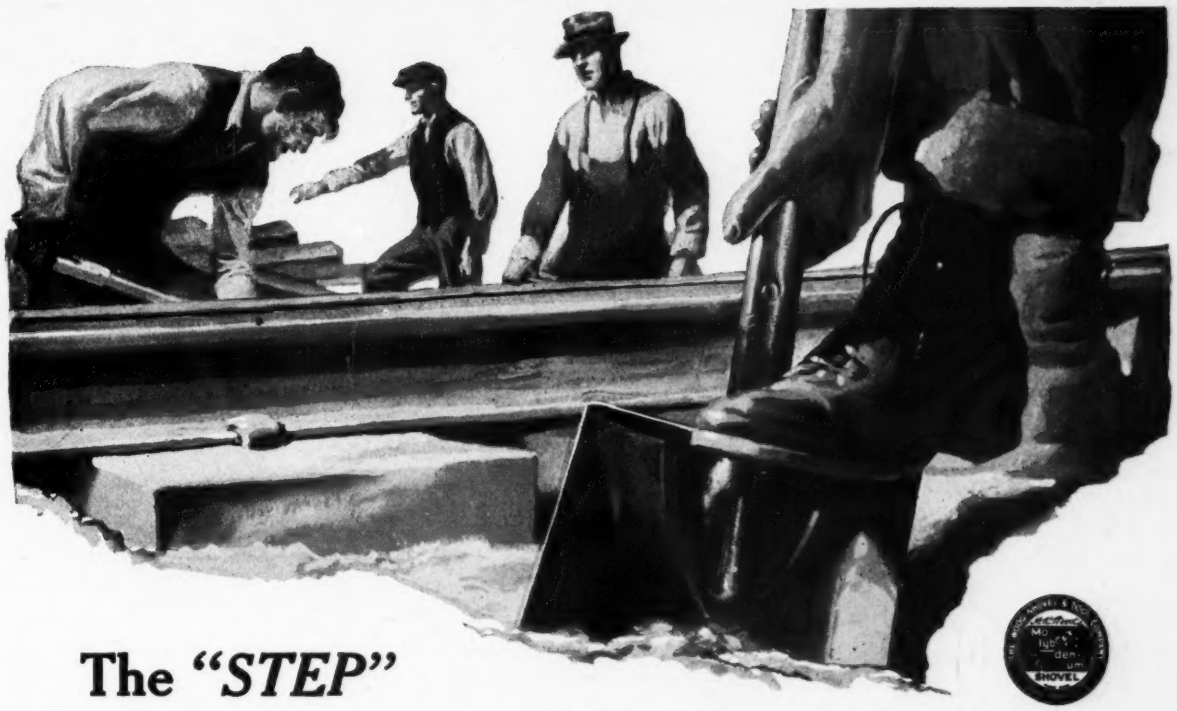

The *"STEP"* that has revolutionized shovels

EVER since shovels have been used, millions of men, the world over, have been pushing them into the ground with their feet. They have been wearing out their shoes—and in many cases getting sore feet—from continual pressure on the sharp edge. But no one thought to correct this condition until Wood invented the "step" shovel.

This "step," or turned over edge, has achieved a double purpose. Not only is the shovel easier on the men's feet and shoes—not only does it give better leverage—but it adds materially to the strength of the blade.

There are now more than 100,000 Wood's Mo-*lyb*-den-um Step Shovels in use—and not a single case of a broken blade. The men who are using them are enthusiastic—and acclaim this invention as the greatest shovel improvement in years.

The Wood's Mo-*lyb*-den-um Steel Shovel has attained a standard of high quality which places it in a class by itself. It will outwear any other shovel made, from two to six times. This has been proved by actual tests. Large contractors who have adopted these shovels have cut their shovel bills in half. Write to-day for folder showing their application to all your needs.

THE WOOD SHOVEL & TOOL COMPANY
Piqua, Ohio, U. S. A.

Distributors of
Wood's Mo-*lyb*-den-um *Steel Shovels*

Atlanta, Ga., J. M. Tull Rubber & Supply Co.
Baltimore, Md., Codd Tank & Specialty Co.
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Charlotte, N. C., Smith-Wadsworth Hardware Co.
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Chattanooga, Tenn., James Supply Co.
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Evansville, Ind., Evansville Supply Company
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Knoxville, Tenn., Tennessee Mill & Mine Supply Co.
Los Angeles, Calif., Brown-Bevis Company
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New York City, N. Y., Manning, Maxwell & Moore, Inc.
Norfolk, Va., Empire Machinery & Supply Corp.
Oklahoma City, Okla., Oklahoma Hardware Company
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Pittsburgh, Pa., Frick & Lindsay Company
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Salt Lake City, Utah, Salt Lake Hardware Company
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San Francisco, Calif., Baker, Hamilton & Pacific Co.
San Francisco, Calif., Dunham, Carrigan & Hayden Co.
Seattle, Washington, Schwabacher Hardware Co.
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Syracuse, N. Y., Burhans & Black, Inc.
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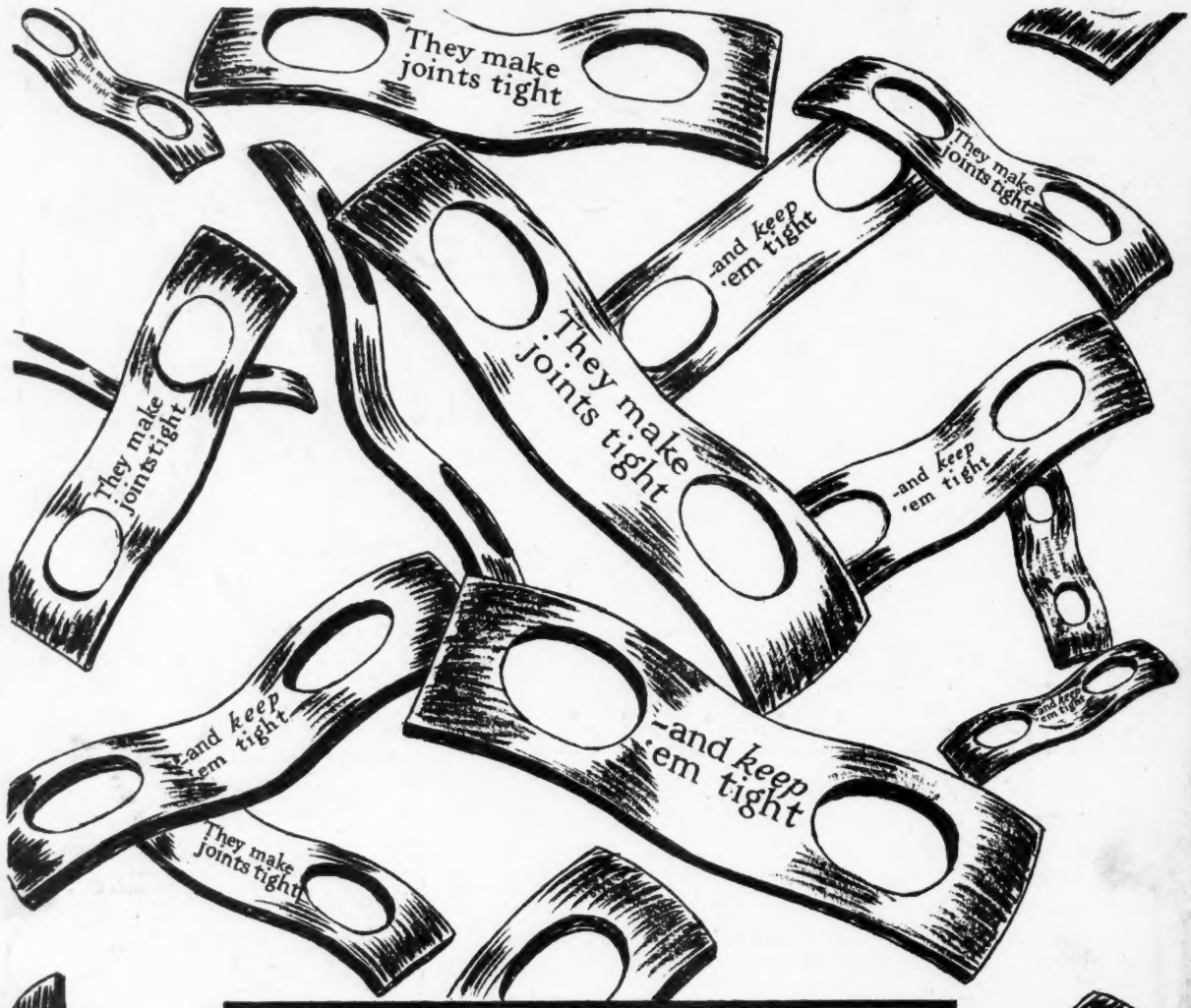
Toledo, Ohio, Bostwick-Braun Co.
Wheeling, W. Va., Greer & Laing
Youngstown, Ohio, Stambaugh-Thompson Co.

Wood's Mo-lyb-den-um Shovels
The American Super Steel



They make joints tight

That is easy. It is possible to make joints tight with a wrench alone—without any nut-locking device whatsoever. It is possible to store considerable reactive pressure in the elasticity of a heat-treated bolt. But Verona Rail Joint Springs make joints tight.

and *keep* 'em tight

That is *not* easy. To keep joints tight, a nut-locking device should compensate for the conditions that make joints loose—bolt stretch, rust, wear, and corrosion. Verona Rail Joint Springs deliver an average of 48,000 pounds thru a distance of 1-16 of an inch. After the initial application and two tightenings, it is never necessary to touch the bolts until new rail is laid.

VERONA TOOL WORKS

Pittsburgh · San Francisco · New York · New Orleans · Chicago · Washington · Boston · St. Paul · St. Louis · Denver


1924